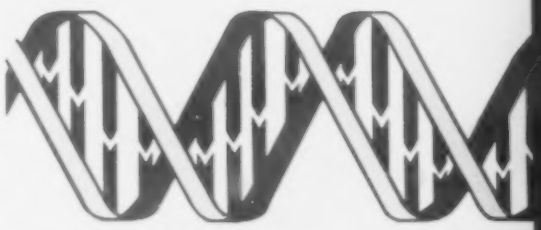
MEDICAL MONITORING and SCREENING in the WORKPLACE

RESULTS OF A SURVEY



Background Paper

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OFFICE OF TECHNOLOGY ASSESSMENT

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MEDICAL MONITORING and SCREENING in the WORKPLACE

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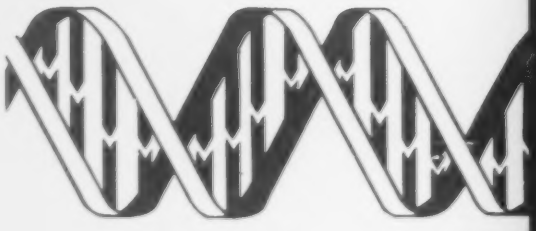

Background Paper

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Foreword

Screening of prospective employees for health status and certain behaviors and monitoring of workers' health are generally thought to be widespread in American workplaces, but few data exist about either practice. This OTA Background Paper presents the results of a survey of 1,500 U.S. companies, the 50 largest utilities, and the largest unions. The survey was designed to obtain information about the types of medical monitoring and screening done in the United States and the extent of their use. OTA finds that virtually all large U.S. employers use some of these tests.

OTA commissioned the survey in support of its October 1990 OTA assessment *Genetic Monitoring and Screening in the Workplace*. In contrast to that report, which focused on the issues associated specifically with *genetic* monitoring and screening in the workplace, this Background Paper discusses survey results concerning the more general topic of *medical* monitoring and screening as well as providing additional information about genetic monitoring and screening. The 1990 assessment was requested by the Senate Committee on Commerce, Science, and Transportation; House Committee on Energy and Commerce; and the House Committee on Science, Space, and Technology. It was also endorsed by the Senate Committee on Labor and Human Resources.

This Background Paper documents:

- attitudes of corporate personnel and health officers about the appropriateness of medical and genetic monitoring and screening;
- some of the corporate criteria used to set health and other qualifications for employment;
- policies on informing employees and job applicants of test results;
- provisions for company and employee access to medical records; and
- the cost-effectiveness estimates for various tests.

OTA was assisted in preparing the survey instrument and Background Paper by a panel of advisors selected for their expertise and diverse points of view on the issues covered in the report. Advisory panelists were drawn from industry, academia, labor organizations, legal, scientific and professional organizations, research organizations, and Federal agencies.

We gratefully acknowledge the contribution of each of these individuals. OTA, however, remains solely responsible for the contents of this Background Paper.

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NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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Chapter 1

Summary and Overview

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Chapter 1
Summary and Overview

In October 1990, the Office of Technology Assessment (OTA) released its assessment *Genetic Monitoring and Screening in the Workplace*, which considers the scientific, legal, ethical, and social aspects of the use of such tests in a workplace setting. It also delineates options for congressional action with regard to issues related to genetic monitoring and screening in the workplace. As part of the assessment, OTA commissioned a survey on genetic monitoring and screening in the workplace of 1,500 U.S. companies, the 50 largest utilities, and the 33 largest unions. The survey was conducted from March 24 to July 15, 1989.

The 1989 OTA survey gathered information about corporate employment practices and policies in general, and corporate practices and policies concerning genetic monitoring and screening in particular. This was done to provide important background information that would supplement and help to explain the information received about genetic monitoring and screening. This background paper presents the survey data that was not published in the full assessment.

OTA investigated a variety of employment practices including preemployment health examinations, employee health qualifications and monitoring of workers' health. In addition, the survey obtained information about other practices such as record-keeping and the release of medical test results to job applicants and workers.

The survey results were also interpreted in the context of a 1982 OTA survey on genetic monitoring and screening (part of the 1983 OTA assessment *The Role of Genetic Testing in the Prevention of Occupational Disease).* Trend data on the use of genetic monitoring and screening can be obtained by tabulating comparable questions in the 1989 and 1982 surveys. Of the 330 Fortune companies (62.4 percent) responding to the 1989 survey, 20 health officers reported that their companies had conducted genetic monitoring or screening, either currently or in the past 19 years. In comparison, the 1982 survey found 18 health officers in the Fortune 500 sample who reported current or past use. Thus, there has been little change between 1989 and 1982 in the number of companies that had used genetic monitoring or screening in the workplace.

In summary, the 1989 survey found 12 Fortune 500 companies reporting current use of genetic monitoring or screening for research or any other reason. The ratio of current to past use of monitoring or screening was reversed in 1982, with 6 companies indicating current use of genetic monitoring or screening and 12 companies indicating past but not current use.

PREEMPLOYMENT SCREENING

The OTA survey briefly explored corporate policy concerning an illustrative range of job applicant attributes that might affect employment eligibility. Some job qualifications involve experience and skills, while others may relate to cost or risk (e.g., loss, casualty, or liability) that the applicant represents to the company.

Fifty-two percent of corporate personnel officers surveyed reported that their companies had a policy concerning hiring persons with criminal records. Of those companies having such policies, over a third (37 percent) said their policies prohibited the hiring of applicants with criminal records, while 8 percent said their policies did not. Fifty-four percent in companies with such policies said it depended on the situation. Cigarette smoking is an example of a personal habit that may represent potential costs to the employer. Despite the fact that cigarette smoking is recognized as a behavior carrying significant risks for cancer, heart disease, and other negative health outcomes, only 8 percent of personnel officers reported that their companies had policies concerning hiring cigarette smokers. Nearly a third (29 percent) of those companies with policies said that it was against corporate policy to hire smokers, while 46 percent said that it was not. Nineteen percent in companies with such policies said the circumstance would dictate the hiring of smokers.

OTA also examined company policies on preexisting medical conditions. Personnel officers in more than a third (35 percent) of the companies responding to the OTA survey reported having company policies concerning hiring persons with preexisting medical conditions. Sixty-nine percent of such

companies said it depended on the situation, while 6 percent said it was against corporate policy to hire those with preexisting medical conditions. Nineteen percent said it was not against corporate policy to hire them.

Finally, OTA found 5 percent of companies having a policy on hiring persons with increased genetic susceptibility to substances or conditions in the workplace. Of those companies with a policy, five percent said their policies prohibited the hiring of such people, while 13 percent said their policies did not.

These three areas did not exhaust the range of employee characteristics that might be factored into an employment decision. However, they provided a simple illustration that large companies had identified a range of factors that could affect a job applicant's employment eligibility. All of these factors represented preexisting conditions (criminal record, smoking, genetic or medical conditions) which may or may not influence the applicant's ability to do the job. Few companies reported a straight-forward policy of excluding persons with criminal records, who smoke cigarettes, or with preexisting genetic or medical conditions from eligibility for employment. In at least some of these areas, a substantial proportion of large companies had employment policies that may have excluded such people from some jobs or under certain conditions.

The majority of health officers responding to the survey (69 percent) reported that there were no specific medical criteria, other than those mandated by regulation, that excluded job applicants from specific jobs, sites, or positions in their companies. However, 27 percent of the health officers reported the existence of medical criteria that affected the employment eligibility of job applicants. These included back ailments or problems, pregnancy, sensitivity to materials used in production, and respiratory conditions.

Medical examinations are often required as a condition of employment for job applicants in large corporations.[1] When asked whether preemployment health examinations are required of all, most, some, few, or no job applicants, about half of the health officers (49 percent) reported that preemployment health examinations were required of *all* job applicants. An additional 10 percent of respondents reported their companies required preemployment medical examinations of *most* job applicants.

Health and personnel officers were queried about what preemployment examinations they considered acceptable. Large majorities considered tests acceptable when they are used to identify applicants who were either physically unfit for employment (92 percent and 89 percent, respectively), currently using drugs (86 percent and 89 percent, respectively), at increased risk to workplace hazards (85 percent and 84 percent, respectively), or emotionally and psychologically unstable (77 percent and 73 percent, respectively).

The use of preemployment tests to identify job applicants who represented high insurance risks was found to be acceptable to a smaller proportion of health and personnel officers, 49 percent and 53 percent, respectively. Similarly, about half the health officers (51 percent) and personnel officers (52 percent) said their companies would approve of preemployment health exams to screen for job applicants with genetic susceptibility to workplace exposures.

Corporate personnel officers were asked about some of the types of preemployment exams that job applicants might be required to have. Fifty-one percent of personnel officers reported that routine physical exams were required of all applicants, as a condition of employment. Drug testing, as part of preemployment examinations for all applicants was reported by 38 percent of personnel officers. The majority (81 percent) of personnel officers responded that personality and/or psychological testing was never required of job applicants.

In companies where examination of job applicants was required, personnel officers were asked whether it was company policy to inform applicants of any positive test results. In most cases (81 percent), the corporate personnel officers reported that company policy was to inform applicants of positive test results from their preemployment examination. However, 16 percent of the corporations conducting preemployment health examina-

[1]The OTA survey was conducted prior to enactment of the Americans with Disabilities Act (ADA) (Public Law 101-336). Beginning in July 1992, ADA bars preemployment medical examinations unless they are job-related and consistent with business necessity. Examining the ADA's effect on the practices uncovered by this survey is beyond the scope of this background paper.

tions as part of their hiring practices reported that it was not company policy to inform applicants of positive test results.

Corporate health officers were asked whether their office or the corporate personnel office decided which specific tests would be included in preemployment screening. Over half (53 percent) said the corporate personnel office made the decision. By contrast, only 27 percent said the corporate health office determines which tests were included in preemployment screening of job applicants.

MONITORING WORKER HEALTH

Medical screening in the workplace involves evaluating job applicants using certain medical criteria before they are hired, or the periodic examination of workers already employed. It can range from a cursory questionnaire to an oral history to a full preemployment physical, and is usually not intended to be diagnostic. Medical monitoring, on the other hand, involves the periodic evaluation of employees for either the effects of a toxic substance or its byproducts. A portion of the workforce in many large corporations is exposed to workplace conditions or substances that represent a health risk to some or all employees. Two examples of such workplace risks are chemicals and ionizing radiation. Some workplace hazards impose an equal risk on all employees. However, other workplace exposures represent special risks to certain employees, depending on their individual characteristics. One mechanism a company has to detect any damage the worker might be incurring as a result of such exposure is to conduct some form of medical monitoring.

The survey indicated the requirement for preemployment health examinations of job applicants was accepted by a majority of corporate personnel officers—regardless of whether there were known health risks in the workplace setting. A somewhat different picture emerged from the survey data regarding the appropriateness of corporate monitoring of employee health when there were no known health risks.

The majority (61 percent) of personnel officers considered it inappropriate to require periodic medical testing of employees in workplace settings where *there were no known risks*. However, the attitude toward employee health monitoring changed radically when there were known health risks in the workplace setting. Almost universally, corporate personnel officers (93 percent) thought periodic medical testing of employees in workplace settings where *there were known health risks* was appropriate.

The survey explored what, if any, types of exams companies require as part of ongoing worker health evaluation. It was found that hearing tests were the most commonly used type of ongoing medical monitoring used by companies. Forty-one percent of health officers reported that hearing tests were required of at least some employees. Other medical monitoring required included chest x-rays (36 percent), blood chemistry tests (35 percent), and vision tests (32 percent). Corporate personnel officers in companies that conducted periodic medical testing of their employees reported, almost universally (93 percent), that it was company policy to refer employees to appropriate health care providers, if positive test results were obtained. Five percent said it was not company policy to refer to appropriate providers.

The OTA survey found that the corporate personnel office of companies surveyed determined the tests to be used in both job applicant screening and employee health surveillance more often than the corporate health office. Thirty-seven percent of health officers reported that the corporate personnel office—not the corporate health office—determined which specific tests were conducted as part of employee health surveillance. By contrast, only 28 percent said that the corporate health office determined which tests were part of employee health surveillance. Fourteen percent said the location health office determined which tests were used, and 14 percent said the location personnel office made the determination.

The cost-effectiveness of medical tests is an important issue for companies when deciding whether to implement a particular test for routine monitoring. The majority reported as cost-effective the use of periodic blood pressure testing (75 percent) and periodic drug testing (72 percent). Few companies (11 percent) reported periodic medical testing for chromosomal abnormalities was cost-effective for companies. The current consensus among corporate personnel officials was that the cost-effectiveness to the company of many forms of employee health monitoring did not extend to genetic monitoring for chromosomal abnormalities.

Medical monitoring and screening of job applicants and employees creates medical records on their past and current health conditions. An issue of major concern is the use of such test findings and who in a company will have access to them. Health officers were asked which corporate office maintains employee health records. The responsibility for employee health records appeared to be evenly divided between the medical or occupational health office and the personnel office. Almost half (47 percent) of responding health officers said employee health records in their companies were located in the medical or occupational health office. Forty-five percent reported the personnel office was responsible for employee health records.

Health officers were asked who had access to medical records and under what situations access was allowed. The health officers, identified by the survey as frequently responsible for employee health records, were asked about the access to those records. For each of nine parties, the questionnaire asked: "Does your company permit access to employee medical records—at company discretion, with employee permission, or both?" About 28 percent of health officers reported that access to employee medical records by the personnel department required the employee's permission. On the other hand, a similar amount (29 percent) reported that the company permitted the personnel department access to those records at company discretion. A quarter (24 percent) reported that access was permitted both at company discretion and with employee permission.

Only a small proportion of companies permitted access to employee medical records to other interested parties without the permission of the employee. The reported incidence of permitting third-party access to employee records, at company discretion, was 15 percent for disability insurance carriers, 15 percent for health insurance carriers, 13 percent for life insurance carriers, 4 percent for other companies, and 3 percent for unions.

The employee's access to his or her own medical records posed another issue. The survey indicated that in 4 in 10 (41 percent) cases, the employee's request was sufficient for the employee to gain access to his or her own medical records. However, about a third of the health officers (36 percent) reported that access to those records by the employee was permitted either at the company discretion or required both company and employee permission.

GENETIC MONITORING AND SCREENING: PRACTICES AND POLICIES

Corporate personnel and health officers were asked the same series of questions about the acceptability within their companies of using genetic monitoring and screening for various purposes. The parallel series of questions allows a comparison of differences in acceptability of such tests in the workplace between those responsible for employee health and those responsible for personnel matters in large corporations.

A majority of the personnel officers surveyed (56 percent) said that their companies considered the use of genetic monitoring and screening for employees or job applicants as generally acceptable to inform employees of their increased susceptibility to workplace hazards. This rate was similar to that of health officers (50 percent).

The survey found some differences between health and personnel officers in their perceptions of the acceptability of genetic tests for some of the other types of occupational health monitoring in their companies. However, the more striking finding is that companies appear to be fairly evenly split over the acceptability of using genetic monitoring and screening in the workplace for the benefit of either the employee or the employer.

In order for companies to make decisions about the feasibility of genetic monitoring and screening, they must decide if the tests are cost-effective. The survey found that cost-effectiveness of genetic monitoring and screening influenced corporate decisions on implementing such programs. Only a small proportion of corporate personnel officers felt that any of the uses of such tests explored in the survey were currently cost-effective. One percent of personnel officers considered the use of direct-DNA (deoxyribonucleic acid) tests as part of preemployment screening currently cost-effective for their companies, while the use of biochemical genetic screening tests as part of preemployment screening was considered as cost-effective by 3 percent of the personnel officers surveyed. Seven percent considered the use of genetic screening to detect susceptibilities to workplace hazards as cost-effective, and 8

percent felt it was cost-effective to conduct genetic monitoring of all workers exposed to workplace hazards. However, almost half (45 percent) felt that such forms of genetic monitoring and screening were not currently cost-effective.

The future of genetic monitoring and screening in the workplace depends on corporate attitudes toward the use of the technology. The possibility that genetic monitoring, and screening may seriously threaten employee rights is a key concern surrounding its use. To gauge employer sensitivity to this issue, health officers were asked whether they agreed or disagreed that genetic monitoring and screening pose such a threat. The survey found that health officers were aware of the concern. Over half (58 percent) of the health officers responding to the survey agreed with the idea that genetic screening represented a potential threat to the rights of employees. Interestingly, those who reported current genetic monitoring and screening were most likely (79 percent) to agree that such testing represented a potential threat to employees.

Since most health officers (62 percent) felt the decision to conduct genetic monitoring and screening should rest with the employer, one might expect relatively little enthusiasm about a government role in the issue of genetic monitoring and screening. However, a majority of health officers agreed that government agencies should provide guidelines for genetic monitoring (60 percent) and screening (58 percent) of job applicants and employees. In companies currently using such genetic tests, the majority (71 percent) agreed that government agencies should provide guidelines in these areas. The interest in government guidelines, however, should not be surprising given the recognition of the potential threat to employee rights raised by the technology, and the division of opinions over the proper uses of such tests.

Cost-effectiveness is not the only consideration for employers in deciding whether to use genetic monitoring and screening. In addition, respondents voiced concerns about the tests' reliability and legality, the liability associated with using them as well as fair and appropriate uses of the technology. The survey identified one factor that changes the perceived cost-effectiveness of genetic monitoring and screening in the workplace: the health insurance risk to the employer of the employee with a genetic disease, condition, or trait. The personnel officers were asked about the degree to which health insurance risk, among otherwise able-bodied job applicants, affected employment decisions. The majority of personnel officers (55 percent) reported that the health insurance risk of an otherwise healthy job applicant would not affect the likelihood of the applicant being hired by their companies. However, the survey found that in more than two out of five companies (42 percent) the health insurance risk (i.e., the risk of incurring health care costs) of the job applicant reduced the likelihood of an otherwise healthy, able job applicant being hired "a lot" (3 percent) or "some" (39 percent).

The effect of concerns about health care risk on employee testing was not simply theoretical. About 1 in 10 personnel officers (11 percent) reported that the health insurance risk of job applicants was assessed on a routine basis. Another quarter of the companies (25 percent) reported that the health insurance risk of job applicants was assessed sometimes. Hence, while a majority of companies (63 percent) reported that they never assessed the health insurance risk of job applicants, more than one-third (36 percent) reported that they did assess health insurance risk, though not necessarily on a routine basis.

The growing concern among employers over the rising costs of employee health insurance, and the increased efforts to reduce those costs to the employer could increase the scope of health insurance screening in the workplace. The cost-effectiveness of employee monitoring and screening may increase to the extent that genetic monitoring and screening can identify employee and dependent risks to atypical subsequent health care demands.

It is important to keep in mind, however, that the OTA survey found that little genetic monitoring and screening is currently being conducted by employers. The survey provides no data that it is currently being used for health insurance screening purposes, nor does it suggest that is the case. Moreover, only a handful of companies not currently conducting genetic monitoring and screening anticipated doing so in the next few years. Based on the survey findings, the specter of health insurance screening appears to be the factor most likely to alter the current and anticipated pattern of use of genetic monitoring or screening in the workplace.

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Preemployment Screening Practices

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Chapter 2
Preemployment Screening Practices

As part of the Office of Technology Assessment (OTA) survey, several questions were asked about various preemployment screening policies of companies.

CORPORATE POLICY AND EMPLOYMENT QUALIFICATIONS

There are normally minimum qualifications required of job applicants for positions within a company. At minimum, applicants must have the ability to perform the job for which they are being considered. Some of these job qualifications may be based on experience, some on training, and some on aptitude. Other employment qualifications may relate to possible costs or risks (e.g., loss, casualty, and liability) that the job applicant represents as an employee to the company. The OTA survey briefly explored corporate policy concerning an illustrative range of job applicant attributes that might affect employment eligibility.

Criminal Records

Fifty-two percent of corporate personnel officers surveyed reported that their companies had a policy concerning hiring persons with criminal records (table 2-1). Of those companies having such policies, over a third (37 percent) said their policies prohibited the hiring of applicants with criminal records while 8 percent said their policies did not. Fifty-four percent reported that individual circumstances played a role in such hiring decisions—there was neither a blanket acceptance nor rejection of applicants with criminal records (table 2-2).

Cigarette Smoking

Cigarette smoking is recognized as a behavior carrying significant risks for cancer, heart disease, and other negative health outcomes. Nonetheless, only 8 percent of corporate personnel officers reported that their companies had a policy concerning hiring cigarette smokers. Nearly a third (29 percent) of those companies with a policy said that it was against corporate policy to hire smokers, while 46 percent said that it was not. Nineteen percent said the circumstance would dictate the hiring of smokers.

Preexisting Medical Conditions

Personnel officers in more than a third (35 percent) of the companies responding to the OTA survey reported that a corporate policy concerning hiring persons with preexisting medical conditions existed. The likelihood of a company establishing a policy concerning preexisting medical conditions varied little with firm size. Among companies with fewer than 5,000 employees, 37 percent had policies about hiring persons with preexisting conditions. An equivalent proportion (38 percent) of companies with 5,000 to 9,999 employees had such policies. A slightly smaller proportion (31 percent) of companies with 10,000 or more employees had policies concerning hiring persons with preexisting conditions.

Only 6 percent of companies that had a policy concerning employment of persons with preexisting conditions said hiring such applicants violated company policy. On the other hand, only 19 percent reported that it was not against policy to hire them. In the majority of cases (69 percent), when such a policy existed, the hiring of an individual with a preexisting condition may or may not have been against company policy—employment was presumably based on the nature of the condition.

Genetic Susceptibility

Only 5 percent of companies reported having a corporate policy concerning hiring persons with increased genetic susceptibility to substances or conditions in the workplace. Of those companies with a policy, 5 percent said their policies prohibited the hiring of people with an increased genetic susceptibility to substances or conditions in the workplace, while 13 percent said their policies did not. Twenty-two percent did not answer the question.

These four areas did not exhaust the range of employee characteristics that might be factored into an employment decision. However, they provided a simple illustration that large companies had identified a range of factors that could affect a job applicant's employment eligibility. All of these

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Table 2-1—Corporate Policy Concerning Hiring of Employees

Q.12a. Does your company have a policy concerning hiring: cigarette smokers; persons with criminal records; persons with preexisting medical conditions; persons with increased genetic susceptibility to substances or conditions in the workplace?

(Base: Personnel officers)

	Unweighted Base	Have policy (in percent)			
		Yes	No	Don't know[a]	No answer
Cigarette smokers	(569)	8	91	0	1
Persons with criminal records	(569)	52	45	*	3
Persons with preexisting medical conditions	(569)	35	62	*	2
Persons with increased susceptibility to substances or conditions in workplace	(569)	5	91	*	4

[a]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Table 2-2—Corporate Policy Concerning Hiring of Employees

Q.12b. Generally speaking, would you say it is against company policy to hire: cigarette smokers; persons with criminal records; persons with preexisting medical conditions; persons with increased genetic susceptibility to substances or conditions in the workplace?

(Base: Personnel officers in companies with hiring policies covering persons asked about)

	Unweighted base	Against policy to hire (in percent)				
		Yes	No	Depends	Don't know[a]	No answer
Cigarette smokers	(43)	29	46	19	0	7
Persons with criminal records	(269)	37	8	54	*	2
Persons with preexisting medical conditions	(211)	6	19	69	*	6
Persons with increased susceptibility to substances or conditions in workplace	(28)	5	13	60	0	22

[a]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

factors represented preexisting conditions (medical or genetic condition, criminal record, smoking) that may or may not bear on the applicant's ability to do the job. Few companies reported a straightforward policy of excluding persons with criminal records, who smoke cigarettes, or with preexisting medical or genetic conditions from eligibility for employment. Nonetheless, in at least some of these areas, a substantial proportion of large companies had employment policies that may have excluded such persons from some jobs or under certain conditions.

EMPLOYEE HEALTH QUALIFICATIONS

Although the survey did not test the proposition, it might be expected that most employers would require that a job applicant or employee be physically fit or able to perform a job, in order to be considered for the position. However, it is not easy to specify what "physically fit" or "able" means in a positive fashion. Therefore, the survey investigated whether companies had established negative health criteria for employment.

The majority of health officers responding to the survey (69 percent) reported that there were no specific medical criteria, other than those mandated by regulation (e.g., chest x-rays for certain jobs), that excluded job applicants from specific jobs, sites, or positions in their companies. However, 27 percent of the health officers reported the existence of medical criteria that affected the employment eligibility of job applicants (table 2-3). The existence of medical criteria for employment was reported most frequently in the industry areas of electric utilities (65 percent), other chemicals (43 percent), and pharmaceuticals (40 percent).

Space was provided for health officers to write in which specific medical criteria excluded employment in which jobs. A variety of medical criteria was cited that excluded job applicants or employees from at least some jobs. In companies that reported medical criteria for at least some jobs, the conditions

Table 2-3—Employee Health Qualifications for Employment

Q.6. Are there any specific medical criteria, other than those mandated by regulation, that would exclude individuals from eligibility for certain positions, jobs, or sites in your company (e.g., hypersensitivity to dust or platinum, pregnancy)?

(Base: Health officers)

	Unweighted base	Have policy (in percent)		
		Yes	No	No answer
Total	(494)	27	69	4
Type of business				
Electrical utility	(39)	65	32	2
Pharmaceutical	(21)	40	58	1
Other chemical	(42)	43	56	2
Petroleum	(5)	38	62	0
Electronic	(19)	39	61	0
Other manufacturing	(154)	29	65	7
Nonmanufacturing	(214)	25	72	3

SOURCE: Office of Technology Assessment, 1991.

most often cited as excluding employment were back ailments or problems (29 percent) and visual acuity or sight impairment (14 percent) (table 2-4). Other frequently cited conditions that excluded applicants from some jobs included pregnancy (8 percent), diabetes (7 percent), hearing impairment or deafness (6 percent), and sensitivity to materials used in production (6 percent). Respiratory conditions, in general (6 percent), and asthma, in particular (2 percent), were also cited.

Other medical conditions that excluded employment in certain jobs were also reported by some health officers. These exclusionary conditions included: epilepsy (5 percent), heart conditions (5 percent), sensitivity to chemicals (4 percent), acquired immune deficiency syndrome (AIDS)/human immunodeficiency virus (HIV) infection (4 percent), color blindness (3 percent), and renal diseases (1 percent). Drug use was also cited (4 percent) as a medical criterion that excluded employment in some jobs. The survey did not determine the consequences to an employee if one of these conditions developed after being hired.

A small number (9 percent) of the health officers reporting medical requirements for employment indicated that the criteria excluded the employee from all, most, or even a wide variety of jobs (table 2-5). The jobs most often excluded for persons that do not meet certain medical criteria were positions requiring heavy lifting or physical labor (20 percent). Other jobs excluded by medical criteria included those involving driving (5 percent), exposure to chemicals (5 percent), exposure to radiation (4 percent), heavy machinery (4 percent), and those requiring good vision (3 percent) and respiratory protection (3 percent).

Table 2-4—Medical Criteria for Employment

Q.6a. Which medical criteria would exclude employment (in which jobs)?

(Base: Health officers in companies that exclude individuals from certain positions)

Unweighted base	(178)
Medical criteria	
Back ailments/problems	29%
Visual impairment/problems with vision	14
Pregnancy	8
Diabetes	7
Hearing impairment/deafness	6
Respiratory problems/conditions	6
Sensitivity to production materials	6
Epilepsy/epileptic seizures	5
Heart/cardiac conditions/diseases	5
AIDS/HIV	4
Allergies/sensitivity to chemicals	4
Drug use/abuse	4
Medical conditions (unspecified)	4
Allergic reactions/sensitivity	3
Color blindness	3
Sensitivity to dust	3
Asthma	2
Medical conditions aggravated by work environment	1
Renal/kidney conditions/diseases	1
All other mentions	32
No answer	15

SOURCE: Office of Technology Assessment, 1991.

Table 2-5—Jobs Excluded by Medical Criteria

Q.6b. In which jobs would employment be excluded by certain medical criteria?

(Base: Health officers in companies that exclude individuals from certain positions)

Unweighted base	(178)
Jobs excluded	
Jobs/positions requiring lifting/heavy lifting/physical labor	20%
Exposure to miscellaneous workplace elements	7
Jobs involving driving/vehicle/mobile operations	5
Exposure to chemicals/chemical toxins	5
Exposure to radiation/radioactive materials	4
Jobs involving heavy machinery/equipment operation	4
Jobs/positions requiring good vision/visual acuity	3
Jobs requiring respiratory protection	3
Jobs involving heights/climbing/high elevation	2
Exposure to lead/heavy metals	2
Exposure to materials harmful during pregnancy	1
Most/various/all positions	9
All other mentions	25
No answer	2

SOURCE: Office of Technology Assessment, 1991.

Table 2-6—Medical Criteria for Employment Exclusion

Q.6a./Q.6b. What is the medical criteria? What position/job/site is excluded? (All mentions)

	Total	Back problem	Allergy	Visual impairment	Pregnancy	Respiratory problem	Drug abuse	Heart condition	Epilepsy	Hearing impairment	Diabetes	Medical condition	All other
Total		41	41	32	24	21	14	13	11	10	9	13	72
Jobs/positions requiring good vision/visual acuity	15	—	—	13	—	—	—	1	—	1	—	—	—
Jobs/positions requiring lifting/heavy lifting physical labor	48	30	—	1	2	1	—	1	—	—	—	—	13
Jobs involving heavy machinery/equipment operation	17	2	4	2	—	1	—	—	3	—	2	—	3
Jobs involving driving/ vehicle/mobile operations	25	—	1	10	—	—	2	1	5	2	3	1	—
Jobs requiring respiratory protection	13	—	—	—	—	7	—	4	1	—	1	—	—
Jobs involving heights/ climbing/high elevation	13	3	—	—	—	—	—	—	3	—	1	—	6
Jobs with rotating swing/ frequently changing shifts	5	—	—	—	—	1	—	—	—	—	4	—	—
Exposure to lead/heavy metals	10	—	2	—	4	2	—	—	—	—	—	—	2
Exposure to chemicals/ chemical toxins	32	—	11	1	5	5	1	—	—	—	—	1	9
Exposure to radiation/ radioactive materials	11	—	—	—	3	1	—	1	—	—	1	—	5
Exposure to materials harmful during pregnancy	8	—	—	—	8	—	—	—	—	—	—	—	—
Exposure to miscellaneous workplace elements	15	—	8	—	1	—	—	2	—	1	—	—	3
Most/various/all positions	32	1	4	2	1	1	10	—	—	—	—	6	7
All other mentions	70	8	12	3	—	2	2	3	1	7	1	2	29
No answer	11	1	2	1	1	—	—	—	1	—	—	4	1

NOTES: These are unweighted responses and not percentages. Allergy column head includes allergic reactions and sensitivity to dust, materials and chemicals; Visual impairment includes color blindness; Respiratory problems include asthma; All other column includes renal/kidney condition, AIDS, and no answer.

SOURCE: Office of Technology Assessment, 1991.

It is interesting to examine a couple of examples in depth (table 2-6). Health officers were given three blank spaces to write in medical criteria that excluded employment in certain jobs. Of the 41 cases where back problems were cited as a reason for excluding people from jobs, 30 of them were for jobs requiring lifting, 2 were for jobs involving heavy machinery, 3 were for jobs involving heights, 1 was for exclusion for most, various, or all positions, and 8 were for other reasons. (This table presents data from all three mentions that health officers made.) Drug abuse was cited as a cause for job exclusion in 14 cases—2 involving driving, 1 exposure to chemicals, 10 for most, various, or all positions, and 2 for other reasons.

Preemployment Health Examinations

Medical examinations are often required of applicants for jobs in large corporations.[1] When asked whether preemployment health examinations are required of all, most, some, few, or no job applicants, about half of the health officers (49 percent) reported that preemployment health examinations were required of *all* job applicants. Moreover, the survey found 59 percent of respondents reported their companies required preemployment medical examinations of *all or most* job applicants (table 2-7).

The notion of required preemployment examinations was widely accepted as appropriate. Virtually all (94 percent) corporate personnel officers surveyed considered it appropriate to require preemployment health examinations of job applicants in workplace settings where there were known risks (table 2-8). However, the survey indicated that the existence of *known risk* was not primarily responsible for the acceptability of preemployment examinations. Even when *there were no known health risks*, two-thirds (67 percent) of corporate personnel directors considered preemployment health examinations of job applicants appropriate (table 2-9).

Appropriate Use of Preemployment Examinations

The OTA survey asked corporate health and personnel officers what their company policies were toward some of the possible purposes and uses of preemployment medical exams. Identical questions were put to both corporate health officers and personnel officers to see whether their different roles might produce different norms concerning company policies on the uses of medical information collected from job applicants.

Table 2-7—Corporate Requirements for Preemployment Health Examinations

Q.1. In your company, are preemployment health examinations required of all, most, some, few, or no job applicants?

(Base: Health officers)

Unweighted base	(494)
All job applicants	49%
Most job applicants	10
Some job applicants	7
Few job applicants	4
None	28
No answer	2

SOURCE: Office of Technology Assessment, 1991.

Table 2-8—Views on Preemployment Health Exams When There Are Known Health Risks

Q.2. Do you think it is generally appropriate or generally inappropriate for a company to require preemployment health examinations of job applicants in workplace settings where *there are known health risks*?

(Base: Personnel officers)

Unweighted base	(569)
Appropriate	94%
Inappropriate	5
No answer	1

SOURCE: Office of Technology Assessment, 1991.

Table 2-9—Views on Preemployment Health Exams When There Are No Known Health Risks

Q.1. Do you think it is generally appropriate or generally inappropriate for a company to require preemployment health examinations of job applicants in workplace settings where *there are no known health risks*?

(Base: Personnel officers)

Unweighted base	(569)
Appropriate	67%
Inappropriate	32
Don't know[a]	*
No answer	1

[a]Volunteered response.
*Indicates less than 1 percent.

SOURCE: Office of Technology Assessment, 1991.

[1]The OTA survey was conducted prior to enactment of the Americans with Disabilities Act (ADA) (Public Law 101-336). Beginning in July 1992, ADA bars preemployment medical examinations unless they are job-related and consistent with business necessity. Examining the ADA's effect on the practices uncovered by this survey is beyond the scope of this background paper.

Table 2-10—Views on Preemployment Health Exams To Identify Applicants Who Represent Risks

Q.2. Would your company consider it acceptable or unacceptable to conduct a preemployment health examination in order to identify job applicants?

(Base: Health officers/personnel officers)

	Unweighted base	Percent				
		Acceptable	Un-acceptable	Depends[a]	Don't know[a]	No answer
Who are physically unfit for employment:						
Health officers	(400)	92	3	0	0	5
Personnel officers	(542)	89	10	0	0	0
Who are emotionally or psychologically unstable:						
Health officers	(400)	77	14	*	1	9
Personnel officers	(542)	73	23	0	1	3
Who are currently using drugs:						
Health officers	(400)	86	7	0	*	7
Personnel officers	(542)	89	9	0	1	2
Who are at increased risk to workplace hazards:						
Health officers	(400)	85	8	0	*	7
Personnel officers	(542)	84	13	0	0	3
With genetic susceptibility to workplace exposures:						
Health officers	(400)	51	34	1	1	13
Personnel officers	(542)	52	40	0	1	6
Who represent high insurance risks:						
Health officers	(400)	49	40	0	1	10
Personnel officers	(542)	53	41	0	*	6

[a]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Physical Fitness

There was almost universal agreement among corporate health and personnel officers that their companies would consider it acceptable to conduct preemployment medical examinations to identify job applicants who were *physically unfit for employment.* Nine out of ten (89 percent) corporate personnel officers said that their companies would consider it acceptable to conduct a preemployment health examination for that purpose. About the same proportion (92 percent) of corporate health officers agreed that this use of preemployment examinations would be acceptable (table 2-10).

Drug Use

The acceptability of using preemployment health examinations to identify job applicants who were *currently using drugs* was also almost universal. Nine out of ten personnel officers (89 percent) said that their companies would consider it acceptable to conduct preemployment examinations for that purpose. A similar proportion of health officers (86 percent) agreed with them.

Workplace Risks

The majority of personnel and health officers also reported that the use of preemployment examinations would be considered acceptable in their companies to identify job applicants *who were at increased risk to workplace hazards.* Six out of seven personnel officers (84 percent) reported that their companies would consider it acceptable to screen job applicants for increased risk to workplace hazards. About the same proportion of corporate health officers (85 percent) concurred.

Emotional and Psychological Stability

The majority of corporate officials responding to the survey also reported that their companies would consider the use of preemployment health exams to identify persons who were *emotionally or psychologically unstable* as appropriate. Nearly 3 out of 4 personnel officers (73 percent) said that the use of preemployment exams for this purpose would be considered acceptable to their companies. A similar proportion of health officers (77 percent) agreed that this use of preemployment health examinations would be acceptable.

Table 2-11—Preemployment Screening Requirements

Q.10. As part of your preemployment hiring practices, do you currently require each of the following as a condition of employment for all applicants, only applicants for certain plants or job classifications or histories, or for no applicants?

(Base: Personnel officers)

		Percent					
	Unweighted base	All applicants	Selected plants/ jobs	Selected conditions/ histories	Both[a]	None	No answer
Routine physical examination	(569)	51	14	3	1	31	1
Other medical criteria, e.g., lower back x-ray, allergy testing	(569)	10	18	11	2	56	2
Personality/psychological testing	(569)	2	9	5	*	81	3
Drug testing	(569)	38	10	1	*	48	3

[a]Both "plants/jobs" and "conditions/histories" volunteered.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Insurance Risks

In addition to issues of physical and behavioral suitability for employment, the health and personnel officers were asked about the acceptability of using preemployment health examinations to identify job applicants who represented *high insurance risks*. About half (53 percent) of the corporate personnel officers surveyed reported that screening for high insurance risk would be an acceptable reason for preemployment examinations in their companies. A similar proportion of health officers (49 percent) agreed with them.

Genetic Susceptibility

The survey also found that a majority of the corporate health and personnel officers concurred that their companies would consider it acceptable to screen job applicants for genetic susceptibility to workplace exposures. Fifty-two percent of personnel officers and 51 percent of health officers reported that their companies would approve of a preemployment health examination to identify job applicants with *genetic susceptibility to workplace exposures*.

Types of Preemployment Examinations

The survey interviewed the corporate personnel officers about some of the types of preemployment examinations that might be required of job applicants.

Physical Examinations

The majority of personnel officers (51 percent) reported that *routine physical examinations* were required as a condition of employment for applicants, regardless of plant or job classifications, or medical conditions or histories. A smaller number (14 percent) reported that routine physical examinations were required as a condition of employment for at least certain plants or job classifications. However, 31 percent of corporate personnel officers reported that their preemployment hiring practices required no routine physical examinations for applicants (table 2-11).

Drug Testing

Drug testing, as part of preemployment examinations, was also reported by many personnel officers. Nearly 4 out of 10 (38 percent) companies reported that *drug testing* was required as a condition of employment for all job applicants. In addition, another 10 percent required drug testing as part of the preemployment hiring practices for at least certain plants or job classifications. Only 1 percent reported that drug testing was restricted to job applicants with certain medical conditions or histories. Forty-eight percent reported that their preemployment hiring practices required no drug testing for applicants.

Other Medical Criteria

A number of companies (10 percent) required *other medical criteria*, such as lower back x-rays or allergy testing, for all jobs. However, some companies required other medical criteria as part of their hiring practices for certain plants or job classifications (18 percent), applicants with certain medical conditions or histories (11 percent), or both (2 percent). Fifty-six percent reported that their preemployment hiring practices required no other medical criteria as part of their preemployment hiring practices.

Table 2-12—Tests Conducted for Preemployment Examinations

Q.3. Which of the following are normally part of the preemployment examination in your company for nonadministrative positions?[a]

(Base: Health officers in companies that require preemployment examinations of job applicants)

Unweighted base	(400)
Personal medical history	93%
Family medical history	35
Simple physical examinations	89
Standard blood chemistry tests	55
EKG	16
Chest x-ray	43
Pulmonary function test	22
Eye and hearing exam	67
Urinalysis for drug abuse	54
Lower back x-ray	20
Don't know[b]	*
No answer	3

[a]Respondents could give more than one answer.
[b]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

By contrast, *personality and/or psychological testing* is rare as part of preemployment examinations. Four out of five personnel directors (81 percent) said that it was never required. Whereas, 9 percent reported that personality or psychological testing was required for certain plants or job classifications and 5 percent said it was required for applicants with certain medical conditions or histories. In light of the fact that the majority of corporate officials reported that their companies would consider using preemployment health exams to identify persons who were emotionally or psychologically unstable as appropriate, it is interesting to note that this type of testing is rare.

Screening for Nonadministrative Positions

Corporate health officers, who reported that preemployment examinations were required of at least some employees, were asked what kinds of tests were normally part of the preemployment examinations in their companies for nonadministrative positions. A personal medical history was the most commonly reported requirement (93 percent) of the preemployment examination (table 2-12). Many also required simple physical examinations (89 percent) as part of preemployment examination for nonadministrative positions. Eye and hearing exams (67 percent) and family medical histories (65 percent) were frequently reported as normal parts of preemployment examinations.

Table 2-13—Preemployment Test Policies: Informing Applicants of Positive Results

Q.11. Is it company policy to inform applicants of positive test results?

(Base: Personnel officers in companies that require any type of examination of job applicants)

Unweighted base	(473)
Yes	81%
No	16
Not sure	1
No answer	3

SOURCE: Office of Technology Assessment, 1991.

In 4 out of 10 (38 percent) companies surveyed, the corporate personnel officer indicated that drug testing was required for all positions. The health officers confirmed this widespread adoption among large corporations of routine drug testing at the preemployment stage. Among health officers in corporations with any preemployment examinations, 54 percent reported that urinalysis for drug use was a normal part of the preemployment examination for nonadministrative positions. This represents 44 percent of the total health officer sample.

More than half (55 percent) of companies requiring any form of preemployment exams reported requiring standard blood chemistry tests. A minority also reported requiring chest x-rays (43 percent) or pulmonary function tests (22 percent). A lower back x-ray was required as part of the normal preemployment examination of job applicants by 20 percent of the companies requiring preemployment exams. One-sixth (16 percent) said that electrocardiograms (EKGs) were a normal part of the preemployment exam.

Release of Examination Results to Applicants

The personnel officers in companies conducting any type of examination of job applicants as part of their preemployment hiring practices were asked whether or not it was company policy to inform applicants of positive (abnormal findings) test results. In most cases (81 percent), the corporate personnel officer reported that the company policy was to inform applicants of positive test results from their preemployment examination. However, among the corporations conducting preemployment health examinations as part of their hiring practices, 16 percent reported that it was not company policy to inform applicants of positive test results (table 2-13).

Table 2-14—Types of Preemployment Exam Results Normally Released

Q.4. Which of the following types of preemployment examinations would normally be released to job applicants?[a]

(Base: Health officers in companies with any form of preemployment examination)

Unweighted base	(400)
Normal results (negative findings)	22%
Positive findings already indicated in medical history	15
Positive findings not reflected in medical history	21
Positive findings which disqualify them from employment	22
Positive findings which affect position/site eligibility	15
All of the above	50
Net: Normal results only	3
Net: Positive results only	63
None	12

[a]Respondents could give more than one answer.

SOURCE: Office of Technology Assessment, 1991.

Corporate health officers were asked a slightly different question. Those in companies that conducted any form of preemployment examination were asked what kinds of results from a preemployment examination would normally be released to a job applicant. Fifty percent reported that both normal results (negative findings) and any type of positive findings would usually be released to a job applicant (table 2-14). In addition, another 22 percent reported that positive findings which disqualified the applicant from employment were released; 21 percent reported that positive findings not reflected in the medical history were released; 15 percent reported that positive findings which affected eligibility for positions or sites were released; and 15 percent reported that positive findings already indicated in the medical history were released. However, mirroring the response of the personnel officers, 12 percent of the health officers in companies conducting preemployment health examinations reported that no results from the preemployment exams were normally released to job applicants.

In companies that release information from the preemployment health examinations to job applicants, the information was normally released to the job applicant as part of a consultation with the medical staff. This was done through a medical consultation only (47 percent), or with both a letter and medical consultation (23 percent). Few companies reported releasing the information to job applicants through letters alone (6 percent) (table 2-15).

Table 2-15—How Information on Preemployment Exams Is Normally Released

Q.5. How would that information normally be released to job applicants?

(Base: Health officers in companies that normally release results of preemployment examinations)

Unweighted base	(335)
Letter	6%
Consultation with medical staff	47
Both	23
Consultation and other	2
Other	21

SOURCE: Office of Technology Assessment, 1991.

Table 2-16—Company Referrals to Health Care Providers if Positive Results Are Obtained From Preemployment Tests

Q.11a. Is it company policy to refer applicants to appropriate health care providers if positive test results are obtained?

(Base: Personnel officers in companies that require any type of examination of job applicants)

Unweighted base	(473)
Yes	59%
No	36
Don't know[a]	*
No answer	4

[a]Volunteered response.

*Indicates less than 1 percent.

SOURCE: Office of Technology Assessment, 1991.

According to corporate personnel officers in companies that did release examination results to job applicants, most companies took steps to refer applicants with positive results to health care providers. Six out of ten (59 percent) personnel officers in companies that released test results said that it was company policy to refer applicants to appropriate health care providers if positive test results were obtained. On the other hand, 36 percent reported that it was not company policy to refer applicants with positive results to health care providers (table 2-16).

Who Decides on Preemployment Tests

Over half (53 percent) of the corporate health officers surveyed said that the corporate personnel office determined which specific tests were a part of the preemployment screening (table 2-17). By contrast, only 27 percent said that the corporate health

office determines which tests were part of the preemployment screening of job applicants. In only a minority of cases did either the health office (11 percent) or the personnel office (16 percent) at the location or establishment level determine which specific tests were performed. These figures added up to more than 100 percent because some respondents indicated more than one office was involved in determining which specific tests would be part of the preemployment screening.

The survey findings indicated that in most companies (72 percent) decisions about specific tests to be used in preemployment screening were made at the *corporate* level. Moreover, in the majority of companies (63 percent), decisions were made about preemployment tests by the personnel office, rather than by the health office.

Table 2-17—Company Office That Determines Inclusion of Tests in Preemployment Screening

Q.30a. Which office determines whether or not a specific test will be conducted as part of *preemployment screening*?[a]

(Base: Health officers)

Unweighted base	(494)
Corporate personnel	53%
Corporate health	27
Location personnel	16
Location health	11
Other	5
Don't know[b]	*
No answer	11
Net: Corporate	72
Net: Personnel	63
Net: Health	35

[a]Respondents could give more than one answer.
[b]Volunteered response.
*Indicates less than 1 percent.

SOURCE: Office of Technology Assessment, 1991.

Chapter 3

Monitoring Worker Health

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Chapter 3
Monitoring Worker Health

In most large corporations, some portion of the workforce is exposed to workplace conditions or substances that represent a health risk to some or all employees. The Occupational Safety and Health Act (Public Law 91-596) requires that each employer "... shall assume safe and healthful working conditions for working men and women." It is well known, however, that some people are more susceptible to adverse effects from some exposures than others. For instance, serum alpha-1-antitrypsin deficiency can enhance the risk of emphysema when people are exposed to certain occupational risk factors. One possible method to protect people with such genetic constitutions and, perhaps, allow higher exposure levels in the workplace, is to identify those at special risk.

Table 3-1—Employee Exposure to Workplace Hazards

Q.7. Are any employees in your company exposed to chemicals or ionizing radiation in the workplace setting?
(Base: Health officers)

	Unweighted base	Percent		
		Yes	No	No answer
Total	(494)	52	46	2
Type of business				
Electrical utility	(39)	84	16	0
Pharmaceutical	(21)	96	4	0
Other chemical	(42)	93	2	5
Petroleum	(5)	93	7	0
Electronic	(19)	51	49	0
Other manufacturing	(154)	54	41	4
Nonmanufacturing	(214)	49	50	1

SOURCE: Office of Technology Assessment, 1991.

WORKPLACE RISK

The survey posed a series of questions to personnel and health officers concerning workplace risks and the monitoring of employees. Two workplace risks important to corporations are chemicals and ionizing radiation. Under certain conditions, exposures to chemicals and ionizing radiation may cause chromosomal damage. Also, certain individuals are more susceptible than others to exposures from these materials (1). As noted in the previous chapter, health officers reported that job applicants and employees with certain medical conditions were excluded from jobs involving exposure to chemicals and radiation.

Chemicals and Ionizing Radiation

The survey found that chemicals and ionizing radiation were fairly common among large corporations. More than half of the corporate health officers (52 percent) reported that at least some of their employees were exposed to chemicals or ionizing radiation in the workplace setting (table 3-1).

The likelihood of employee exposure to chemicals or ionizing radiation clearly varied by industry sector. Almost all health officers from companies classified as pharmaceutical (96 percent), petroleum (93 percent), and other chemicals (93 percent) reported that at least some of their employees were exposed to chemicals or ionizing radiation in the workplace. Similarly, the majority of health officers (84 percent) from companies classified as electric utilities reported these forms of workplace exposure. Half of companies (51 percent) classified as electronic or semiconductor manufacturers reported employee exposure to chemicals or ionizing radiation. However, even among those companies classified as other manufacturing, a majority (54 percent) reported employees exposed to chemical and ionizing radiation. And, almost half (49 percent) of those companies categorized as nonmanufacturing reported some employee exposure to these types of workplace conditions.

Health officers in companies with workplace exposures involving chemicals and ionizing radiation were asked if exposed employees were routinely rotated to avoid prolonged exposure. Forty-one percent reported that employees exposed to chemicals or ionizing radiation were routinely rotated to avoid prolonged exposure. The majority of companies in which there were workplace exposures to chemicals and ionizing radiation (54 percent) reported that exposed employees were not routinely rotated (table 3-2). (This was particularly true for companies in the electronics industry (96 percent), the chemical industry (69 percent), and electric utilities (69 percent), where these types of exposures might have been fairly widespread.)

Table 3-2—Rotation of Employees

Q.7a. Are those employees who are exposed to chemicals or ionizing radiation routinely rotated to avoid prolonged exposure?
(Base: Health officers in companies that report employees are exposed to chemicals or ionizing radiation)

	Unweighted Base	Percent			
		Yes	No	Don't know[a]	No answer
Total	(325)	41	54	2	3
Type of business					
Electrical utility	(36)	30	69	0	1
Pharmaceutical	(20)	26	58	0	16
Other chemical	(40)	31	69	1	0
Petroleum	(4)	52	48	0	0
Electronic	(12)	4	96	0	0
Other manufacturing	(104)	32	57	4	7
Nonmanufacturing	(109)	47	50	2	1
Number of employees					
Less than 5,000	(149)	47	49	2	3
5,000 to 9,999	(53)	33	66	0	2
10,000 or more	(121)	21	67	8	4

[a]Volunteered response.

SOURCE: Office of Technology Assessment, 1991.

It should be noted, however, that several health officers commented that they defined exposure as including the potential for exposure. In other words, employees in certain positions might have run a risk of exposure to chemicals and ionizing radiation without actually being exposed. In these instances, rotation was unnecessary because the exposure was only potential exposure.

Individual Susceptibility to Risk

Some workplace hazards impose an equal risk on all employees. Other workplace exposures, however, represent special risks to certain employees, depending on the individual characteristics of the employee.

The majority of health officers (65 percent) said that none of their employees was exposed to workplace conditions which imposed differential risks on workers depending on individual susceptibilities. On the other hand, nearly a third (31 percent) reported that employees in their companies were exposed to conditions with differential risks for health, depending on the employee's susceptibility (table 3-3). Among pharmaceutical firms alone, 71 percent of health officers reported occupational exposure of employees to conditions with differential individual susceptibility.

MEDICAL SURVEILLANCE OF EMPLOYEES

Two possible motivations for medical surveillance of employees can be inferred from the survey. First, half of all companies surveyed reported employees were exposed to chemicals and ionizing radiation, which were associated with negative health outcomes under certain circumstances. Second, nearly one-third of the companies interviewed reported workplace exposures of some employees to conditions in which health outcomes were related to individual susceptibility. Both of these factors could prompt an employer to monitor employee health because of possible adverse health effects related to exposure.

Appropriateness of Monitoring Worker Health

The survey indicated the requirement for preemployment health examinations of job applicants was accepted by a majority of corporate personnel officers—regardless of whether there were known health risks in the workplace setting. A somewhat different picture emerged from the survey data regarding the appropriateness of corporate monitoring of employee health when there were no known health risks.

Corporate personnel officers were asked whether they believed it is generally appropriate or generally inappropriate for a company to require periodic medical testing of employees in workplace settings where *there are no known health risks*. The majority (61 percent) considered it inappropriate to require medical testing of employees in workplace settings where *there were no known risks* (table 3-4). However, the attitude toward employee health

Table 3-3—Awareness of Known Workplace Conditions to Which Individual Susceptibility May Differ

Q.8. Are any employees in your company exposed to any known workplace condition where there is a greater risk of negative health outcome, depending upon individual susceptibilities?

(Base: Health officers)

	Unweighted Base	Percent			
		Yes	No	Don't know[a]	No answer
Total	(494)	31	65	*	3
Type of business					
Electrical utility	(39)	37	62	1	0
Pharmaceutical	(21)	71	14	0	15
Other chemical	(42)	49	49	2	0
Petroleum	(5)	44	56	0	0
Electronic	(19)	6	91	0	3
Other manufacturing	(154)	35	63	0	2
Nonmanufacturing	(214)	29	67	*	4

[a]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

monitoring changed radically when there were known health risks in the workplace setting. The survey found that, almost universally, corporate personnel officers (93 percent) thought that it was appropriate to require periodic medical testing of employees in workplace settings where *there were known health risks* (table 3-5).

Periodic Medical Testing

A majority of personnel officers (58 percent) said that their corporate policies did not require periodic medical testing of employees in risk categories. However, 4 out of 10 personnel officers (41 percent) reported that periodic medical testing of persons at risk was required under corporate policy (table 3-6). (It should be noted that the Office of Technology Assessment did not define persons at risk, it was left up to the company to define this term.)

Among the companies surveyed, there was no consistent relationship between periodic medical testing of employees and company size. Among firms with less than 5,000 employees, 40 percent reported periodic medical testing. This rate fell to 35 percent in firms with 5,000 to 9,999 employees. However, it was highest (50 percent) in firms with 10,000 or more employees.

The rates of reported employee health monitoring were highest in the petroleum companies (97 percent). A policy of periodic medical testing of employees at risk was also reported by a majority of pharmaceutical companies (72 percent), other chemical companies (68 percent), electronic manufacturers (64 percent), and electric utilities (58 percent).

Table 3-4—Appropriateness of Monitoring When There Is No Known Health Risk

Q.4. Do you think that it is generally appropriate or generally inappropriate for a company to require periodic medical testing of employees in workplace settings where *there are no known health risks*?

(Base: Personnel officers)

Unweighted base	(569)
Appropriate	39%
Inappropriate	61
Not sure	*
No answer	*

*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Table 3-5—Appropriateness of Monitoring When There Is Known Health Risk

Q.5. Do you think that it is generally appropriate or generally inappropriate for a company to require periodic medical testing of employees in workplace settings where *there are known health risks*?

(Base: Personnel officers)

Unweighted base	(569)
Apppropriate	93%
Inappropriate	7
Not sure	*
No answer	1

*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

By contrast, the rate of periodic employee monitoring fell to 47 percent in other manufacturing companies and 36 percent in all other nonmanufacturing companies.

The relationship between occupational exposure to workplace risks and the likelihood of periodic

Table 3-6—Periodic Medical Testing of Persons in Risk Categories

Q.19. Is it your company's policy to conduct periodic medical testing of persons in any risk categories?
(Base: Personnel officers)

	Unweighted base	Percent		
		Yes	No	No answer
Total	(569)	41	58	1
Number of employees				
Less than 5,000	(308)	40	59	*
5,000 to 9,999	(99)	35	64	1
10,000 or more	(154)	50	48	3
Type of business				
Electrical utility	(43)	58	38	3
Pharmaceutical	(20)	72	28	0
Other chemical	(37)	68	26	6
Petroleum	(10)	97	3	0
Electronic	(21)	64	36	0
Other manufacturing	(176)	47	51	1
Nonmanufacturing	(262)	36	63	*

*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

employee health monitoring was put into perspective by the corporate health officers. As noted earlier in this chapter, approximately half of the health officers reported that employees in their companies were exposed to chemicals or ionizing radiation in the workplace setting.

A majority of health officers in companies in which employees were exposed to chemicals or ionizing radiation (53 percent) reported that medical surveillance was conducted of employees whose jobs might have exposed them to health risks (table 3-7). The use of medical surveillance was less frequent among affected companies with fewer than 5,000 employees (46 percent) than among those with 5,000 to 9,000 employees (75 percent) or 10,000 or more employees (66 percent).

The survey yielded information concerning not only the extent of health monitoring among employees at potential risk, but the limits of that monitoring as well. Over half of large companies (58 percent) did not perform any routine employee health monitoring, even among employee groups at risk to occupational health problems. Moreover, even in companies where employees were exposed to chemicals and ionizing radiation, nearly half (46 percent) did not perform *any form* of medical surveillance of workers at risk other than that required by the Occupational Safety and Health Administration (OSHA).

Table 3-7—Medical Surveillance of Employees With Jobs That May Expose Them to Environmental Health Risks

Q.7b. Does your company conduct any form of medical surveillance of employees whose jobs may expose them to environmental health risks, other than testing required by OSHA?
(Base: Health officers in companies with employees exposed to chemicals or ionizing radiation in the workplace)

	Unweighted base	Percent		
		Yes	No	No answer
Total	(325)	53	46	1
Number of employees				
Less than 5,000	(149)	46	52	2
5,000 to 9,999	(53)	75	25	0
10,000 or more	(171)	66	33	1

SOURCE: Office of Technology Assessment, 1991.

Types of Employee Health Evaluations

The survey explored what, if any, types of exams companies require as part of ongoing worker health evaluation and as a condition of continued employment of all employees, only those in certain plants or jobs, or only employees with certain medical conditions or histories. It also obtained information about the companies that require no testing of any workers.

The survey found that hearing tests were the most commonly used type of ongoing health testing of the seven categories investigated in the study. Four out of ten (41 percent) health officers reported that hearing tests were required of at least some employees (table 3-8). Eleven percent reported that hearing tests were required of all applicants.

Blood chemistry tests, chest x-rays, and vision tests were also part of ongoing worker health evaluations in many of the large companies. Approximately one-third of responding companies reported that they tested at least some employees. Tests required included chest x-rays (36 percent), blood chemistry tests (35 percent), and vision tests (32 percent). Thirty percent of responding health officers reported that pulmonary function tests were required of at least some employees. However, only 3 percent of responding health officers reported that pulmonary function tests were required for all employees. Only 6 percent of companies required tests for hypersensitivity for any workers as part of routine health evaluations.

In the bulk of these cases, the requirement for the medical testing was neither companywide nor re-

Table 3-8—Types of Employee Health Evaluations

Q.9a. As part of ongoing worker evaluation, does the company require, as a condition of continued employment, all employees, only those in certain plants or jobs, only employees with certain medical conditions or histories, or no employees to have:
(Base: Health officers)

		Percent						
	Unweighted base	All employees	Selected plants/ jobs	Selected conditions/ histories	Both[a]	None	Don't know[b]	No answer
Routine physical examination	(494)	14	18	4	2	48	*	14
Test for hypersensitivity	(494)	*	2	3	1	69	*	25
Hearing tests	(494)	11	26	2	2	44	*	15
Pulmonary function tests	(494)	3	21	4	2	50	0	20
Vision tests	(494)	11	17	2	2	49	0	19
Chest x-rays	(494)	6	15	13	2	47	0	17
Blood chemistry tests	(494)	10	16	8	1	48	0	17

[a]Both "plants/jobs" and "conditions/histories" volunteered.
[b]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

stricted to workers with certain medical conditions. Rather, these types of ongoing health evaluations were required for employees in certain plants or jobs.

Aside from specific tests, the survey investigated the use of routine physical examinations as part of ongoing worker evaluations. Little more than a third (38 percent) of the companies surveyed reported that routine physical exams were required of any workers. One in seven companies (14 percent) required routine physical examinations as part of ongoing worker evaluations of all employees.

Employee Medical Records

Any medical monitoring and screening of employees and job applicants creates medical records on their past and current health conditions including specific test results. A major concern associated specifically with genetic monitoring and screening, as with all medical testing, is the use of test findings. The use of such information depends, in part, on who will have access to those records. The survey examined the standard practice of industry in maintaining employee health records and permitting access to those records.

All medical testing in the workplace, regardless of the nature of the tests being performed, raises questions of medical records and their maintenance. The survey found that companies conduct a wide variety of job applicant screening tests and ongoing medical evaluation tests of employees. Once such tests are conducted, the question of where the results are kept is raised. Hence, health officers were asked which corporate office maintains employee health records.

The responsibility for employee health records is evenly divided between the medical or occupational health office and the personnel office. About half (47 percent) of the health officers responding to the survey reported that the medical or occupational health office was responsible for employee health records in their companies. In the other half (45 percent), the health officer reported that the personnel office was responsible for employee health records. In only a handful of cases (4 percent) was the responsibility for employee health records lodged in some other corporate office (table 3-9).

Access to Employee Medical Records

The health officers, identified by the survey as frequently responsible for employee health records, were asked about the access to those records. For each of nine parties, the questionnaire asked: "Does your company permit access to employee medical records—at company discretion, with employee permission, or both?"

About 3 in 10 (28 percent) health officers reported that access to employee medical records by the personnel department required the employee's permission. On the other hand, 3 in 10 (29 percent) reported that the company permitted the personnel department access to those records at company discretion (table 3-10). A quarter (24 percent) reported that access was permitted both at company discretion and with employee permission.

Table 3-9—Company Office Responsible for Employee Health Records

Q.39. Which office in your company is responsible for employee health records?
(Base: Health officers)

	Unweighted Base	Percent			
		Medical/ occupational health	Personnel	Other	No answer
Total	(494)	47	45	4	6
Type of business					
Electrical utility	(39)	40	44	9	9
Pharmaceutical	(21)	85	16	0	0
Other chemical	(42)	54	38	0	9
Petroleum	(5)	56	44	0	0
Electronic	(19)	27	68	0	4
Other manufacturing	(154)	53	44	3	4
Nonmanufacturing	(214)	44	45	5	7

SOURCE: Office of Technology Assessment, 1991.

Table 3-10—Company Access to Employee Records

Q.40. Does your company permit access to employee medical records—at company discretion, with employee permission, or both to:
(Base: Health officers)

	Unweighted base	Percent				
		At company discretion	Employee permission	Both	Don't know[a]	No answer
Personnel department	(494)	29	28	24	*	19
Health insurance carriers	(494)	15	38	20	*	27
Life insurance carriers	(494)	13	39	19	*	29
Disability insurance carriers	(494)	15	35	24	*	27
Unions	(494)	3	26	12	*	58
Other companies	(494)	4	31	11	*	55
Employee	(494)	14	41	22	*	23
Employee's spouse	(494)	3	37	13	*	47
Other family	(494)	2	33	13	*	52

[a]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Only a small proportion of companies permitted access to employee medical records to other interested parties without the permission of the employee. The reported incidence of permitting third-party access to employee records, at company discretion, was 15 percent for disability insurance carriers, 15 percent for health insurance carriers, 13 percent for life insurance carriers, 4 percent for other companies, and 3 percent for unions.

The employee's access to his or her own medical records posed another issue. The survey indicated that in 4 in 10 (41 percent) cases, the employee's request was sufficient for the employee to gain access to his or her own medical records. However, about a third of the health officers (36 percent) reported that access to those records by the employee was permitted either at the company discretion or required both company and employee permission.

Statistical Recordkeeping

Corporate personnel officers were asked whether or not their companies maintained statistical data on the reasons for job terminations. Six out of ten companies (62 percent) reported having statistical data on job terminations. There was no clear relationship between company size and the likelihood of maintaining statistical data on job terminations.

Less than 1 percent of the companies surveyed reported that biochemical or cytogenetic tests were listed in statistical data as rejection categories for employee job terminations (table 3-11). Among those that kept statistical data on employee termina-

Table 3-11—Statistical Recordkeeping of Job Termination Reasons

Q.20a. Are biochemical or cytogenetic tests used as rejection categories in these data?
(Base: Personnel officers)

Unweighted base	(354)
Yes	*
No	97%
No answer	3

*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Table 3-13—Informing Employees of Periodic Medical Testing Results

Q.19a. Is it company policy to inform employees of positive test results?
(Base: Personnel officers in companies that conduct periodic medical testing of persons in any risk categories)

Unweighted base	(277)
Yes	97%
No	1
No answer	2

SOURCE: Office of Technology Assessment, 1991.

Table 3-12—Statistical Recordkeeping of Job Termination Reasons

Q.20b. Are other medical criteria used as rejection categories in these data?
(Base: Personnel officers)

	Unweighted base	Percent			
		Yes	No	No answer	Don't know[a]
Total	(354)	20	75	3	1
Number of employees					
Less that 5,000	(354)	19	77	3	1
5,000 to 9,999	(354)	34	61	5	0
10,000 or more	(354)	18	77	4	1

[a]Volunteered response.
SOURCE: Office of Technology Assessment, 1991.

tions, relatively few reported the use of medical criteria as reasons for such actions. One-fifth (20 percent) of companies maintaining statistical data on job terminations reported that medical criteria appeared as termination categories (table 3-12). This was more common among companies with 5,000 to 9,999 employees (34 percent) than among either those with fewer than 5,000 employees (19 percent) or more than 10,000 employees (18 percent).

Release of Test Results to Employees and Others

The personnel officers in companies that conducted any type of periodic medical testing of employees in any risk categories were asked whether it was company policy to inform employees of positive test results. In almost every case (97 percent), the corporate personnel officers reported that it was company policy to inform employees of positive test results. Only 1 percent of corporations that periodically tested their employees had no policy of informing employees of positive test results (table 3-13). Two percent of personnel officers did not answer this question.

Corporate personnel officers in companies that conducted periodic medical testing of their employees reported, almost universally, that it was company policy to refer employees to appropriate health care providers, if positive test results were obtained. Ninety-three percent of personnel officers in companies that conducted periodic testing of employees at risk said that it was policy to refer employees with positive test results to medical providers. Five percent of companies conducting such tests reported that it was not policy to refer employees to health care providers if positive test results were obtained (table 3-14).

The personnel officers in firms conducting health monitoring were also asked if company policy allowed the release of positive test results to anyone outside of the company, other than the employee. In a majority of cases (74 percent), corporate policy did not permit such release. However, nearly a quarter (24 percent) of personnel officers said company policy allowed the release of positive test results, at least under certain circumstances (table 3-15).

Those companies allowing the outside release of positive test results were asked under which circumstances this could happen. Most commonly, such

Table 3-14—Referring Employees to Health Care Providers if Periodic Medical Testing Results Are Positive

Q.19b. Is it company policy to refer employees to health care providers if positive test results are obtained?

(Base: Personnel officers in companies that conduct periodic medical testing of persons in any risk categories)

Unweighted base	(277)
Yes	93%
No	5
No answer	2

SOURCE: Office of Technology Assessment, 1991.

Table 3-15—Releasing Periodic Medical Test Results Outside the Company

Q.19c. Is it company policy to release positive test results to anyone outside the company, other than the employee?

(Base: Personnel officers in companies that conduct periodic medical testing of persons in any risk categories)

Unweighted base	(277)
Yes	24%
No	74
No answer	2

SOURCE: Office of Technology Assessment, 1991.

Table 3-16—Circumstances of Releasing Periodic Medical Test Results Outside the Company

Q.19d. Under what circumstances?

(Base: Personnel officers in companies that release results of periodic medical tests to anyone outside the company)

Unweighted base	(62)
Done with employee's consent/written authorization/release	33%
Through employee's personal/family physician	23
If required by Federal/State law	20
At employee's request	9
Other circumstances	15

SOURCE: Office of Technology Assessment, 1991.

release of positive results occurred with the employee's consent or written authorization for release (33 percent) (table 3-16). Nearly a quarter (23 percent) said that the positive test results could have been released through the employee's personal or family physician. One in five (20 percent) said it was policy to release the results if required by Federal or State law. One in ten (9 percent) said results could be released at the employee's request, with no specification of formal written consent or release. Fifteen percent reported other circumstances under which such information could be released outside of the company.

Table 3-17—Company Office Determining Which Tests Are Conducted as Part of Employee Health Surveillance

Q.30b. Which office determines whether or not a specific test will be conducted as part of *employee health surveillance*?[a]

(Base: Health officers)

Unweighted base	(494)
Corporate personnel	37%
Corporate health	28
Location personnel	14
Location health	14
Other	5
Don't know[b]	*
No answer	21
Net: Corporate	60
Net: Personnel	47
Net: Health	38

[a]Respondents could give more than one answer.
[b]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Who Decides on Surveillance Tests

Thirty-seven percent of health officers reported that the corporate personnel office—not the corporate health office—determined which specific tests were conducted as part of employee health surveillance (table 3-17). By contrast, only 28 percent said that the corporate health office determined which tests were part of employee health surveillance. In only a minority of cases were specific medical surveillance tests determined at the location or establishment level. And, at this level, the health office (14 percent) and the personnel office (14 percent) were equally likely to determine which tests were conducted.

The survey found that in most companies decisions on specific tests for employee health surveillance were made at the corporate level (60 percent), rather than at the establishment level. The survey also suggested that decisions on specific surveillance tests were more often the responsibility of the personnel office than the health office. However, it should be recognized that smaller companies might have no health office.

Cost-Effectiveness of Surveillance Tests

The survey found that health officers reported that the determination of which specific tests were performed as part of employee health surveillance rests, most often, with the personnel office. The survey also explored how corporate personnel officers viewed some of these tests—in terms of

Table 3-18—Views on General Cost-Effectiveness of Periodic Medical Testing

Q.6. Do you think it is generally cost-effective or not cost-effective for a company to conduct periodic medical testing of employees for: (Base: Personnel officers)

	Unweighted Base	Percent			
		Cost-effective	Not cost-effective	Don't know[a]	No answer
High blood pressure	(528)	75	21	1	4
Respiratory function	(528)	54	39	1	6
Malignancies	(528)	42	49	1	8
Hearing function	(528)	58	36	1	5
Vision	(528)	50	42	2	6
Chromosomal abnormalities	(528)	11	76	3	9
Drug abuse	(528)	72	22	1	5

[a]Volunteered response.

SOURCE: Office of Technology Assessment, 1991.

cost-effectiveness. For each of seven types of tests, corporate personnel officers were asked whether they considered periodic medical testing of employees to be generally cost-effective.

Among the seven tests examined in the survey, personnel officers reported periodic medical testing for high blood pressure as the most cost-effective. Three out of four corporate personnel officers (75 percent) considered it cost-effective for a company to conduct periodic medical testing of employees for high blood pressure. Only 21 percent felt periodic blood pressure testing was not cost-effective (table 3-18).

Drug testing was also seen as a cost-effective form of periodic testing by the majority of personnel officers. Nearly three out of four (72 percent) reported that it was generally cost-effective for a company to conduct periodic medical testing of employees for drug abuse. Only 22 percent felt that periodic tests for drug abuse were not cost-effective. A majority of personnel officers considered hearing tests (58 percent), respiratory function (54 percent), and periodic vision testing (50 percent) of employees was cost-effective.

In contrast, a smaller proportion (11 percent) of the personnel officers surveyed said periodic medical testing of employees for chromosomal abnormalities was cost-effective for companies. There was almost no variation in this opinion by company size. Moreover, although there was some variation in the opinion about the cost-effectiveness of periodic monitoring of chromosomal abnormalities by industry type—it was highest among other chemical companies (14 percent) and lowest among electric utilities (5 percent), pharmaceutical companies (5 percent), and electronic manufacturers (0 percent)—these differences were relatively small. The current consensus among corporate personnel officials was that the cost-effectiveness to the company of many forms of employee health monitoring did not extend to genetic monitoring for chromosomal abnormalities.

CHAPTER 3 REFERENCE

1. U.S. Congress, Office of Technology Assessment, *Genetic Monitoring and Screening in the Workplace*, OTA-BA-455 (Washington, DC: U.S. Government Printing Office, October 1990).

Chapter 4

Genetic Monitoring and Screening in the Workplace: Corporate Opinion and Practice

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Chapter 4

Genetic Monitoring and Screening in the Workplace: Corporate Opinion and Practice

ATTITUDES ABOUT GENETIC MONITORING AND SCREENING

To gauge the extent of current and possible future use of genetic monitoring and screening in the workplace, the survey explored corporate attitudes toward such techniques. Health and personnel officers were asked their views concerning corporate genetic monitoring and screening policies, the cost-effectiveness of such testing, and uses and handling of test results.

Genetic testing includes a number of technologies to detect genetic traits, changes in chromosomes, or changes in DNA. As used in the workplace, it encompasses two activities: monitoring and screening. Thus, genetic testing of employee populations involves both examining persons for evidence of induced change in their genetic material (monitoring) and methods to identify individuals with particular inherited traits or disorders (screening).

Company Policy and Genetic Monitoring and Screening

Corporate health officers were asked whether their companies had a formal policy related to genetic tests, either in the screening of job applicants or the monitoring of employee health. Only 1 percent of health officers reported a formal company policy on genetic screening tests. Similarly, only 1 percent reported a company policy on genetic monitoring tests. Hence, even among the largest industrial companies, only a handful of companies had developed a formal policy on genetic monitoring and screening.

Rather than signifying a lack of corporate opinion about the use of such tests, such a response could indicate that attitudes toward genetic monitoring and screening had not been expressed as policy. In order to explore corporate opinion concerning genetic monitoring and screening, the survey asked health and personnel officers about their companies' attitudes toward the use of genetic tests.

Acceptable Uses of Genetic Monitoring and Screening

Corporate personnel and health officers were asked the same series of questions about the acceptability within their companies of using genetic monitoring and screening for various purposes. The parallel series of questions allows a comparison of differences in perceived acceptability of genetic monitoring and screening in the workplace between those responsible for employee health and those responsible for personnel matters in large corporations.

A majority of the personnel and health officers surveyed (56 percent and 50 percent) said that their companies considered the use of genetic monitoring and screening tests for employees or job applicants as generally acceptable to inform employees of their increased susceptibility to workplace hazards (table 4-1 and 4-2). The aim of the question was to get at their understanding of current company policy.

Three of the other five possible uses of genetic monitoring or screening in the workplace were considered as generally unacceptable by pluralities of the personnel officers responding to the question. Close to half (48 percent) felt that their companies would consider it generally unacceptable to conduct genetic monitoring or screening of employees to "exclude employees with increased susceptibility from risk situations." This compares with 51 percent for the health officers. The survey did not ask what happened to employees who were excluded. Over half of the personnel and health officers also felt it would be generally unacceptable to their companies to use genetic tests to "establish links between genetic predisposition and workplace hazards" (52 percent and 55 percent) or to "monitor chromosomal changes associated with workplace exposure" (53 percent and 55 percent).

The personnel officers and health officers differed somewhat in their perceptions of the acceptability of using genetic tests to "establish evidence of pre-employment health status for liability purposes." Although 50 percent of health officers considered

Table 4-1—Acceptable Uses of Genetic Monitoring and Screening: Personnel Officers

Q.8. Would your company consider the use of *genetic tests* for employees or job applicants as generally acceptable or unacceptable to:

(Base: Personnel officers)

	Unweighted base	Percent			
		Generally acceptable	Generally unacceptable	Don't know[a]	No answer
Make a clinical diagnosis of a sick employee	(569)	47	46	1	5
Establish links between genetic predisposition and workplace hazards	(569)	40	52	2	6
Inform employees of their increased susceptibility to workplace hazards	(569)	56	37	1	7
Exclude employees with increased susceptibility from risk situations	(569)	45	48	1	7
Monitor chromosomal changes associated with workplace exposures	(569)	39	53	1	7
Establish evidence of preemployment health status for liability purposes	(569)	47	45	1	7

[a]Volunteered response.

SOURCE: Office of Technology Assessment, 1991.

Table 4-2—Acceptable Uses of Genetic Monitoring and Screening: Health Officers

Q.10. Would your company consider the use of *genetic screening or monitoring* of employees or job applicants as generally acceptable or unacceptable to:

(Base: Health officers)

	Unweighted base	Percent			
		Generally acceptable	Generally unacceptable	Don't know[a]	No answer
Make a clinical diagnosis of a sick employee	(494)	43	48	1	7
Establish links between genetic predisposition and workplace hazards	(494)	36	55	*	9
Inform employees of their increased susceptibility to workplace hazards	(494)	50	42	*	8
Exclude employees with increased susceptibility from risk situations	(494)	39	51	*	10
Monitor chromosomal changes associated with workplace exposures	(494)	34	55	*	10
Establish evidence of preemployment health status for liability purposes	(494)	41	50	*	9

[a]Volunteered response.

*Indicates less than 1 percent.

SOURCE: Office of Technology Assessment, 1991.

this an unacceptable use for genetic tests, 47 percent of personnel officers considered it acceptable.

The use of genetic monitoring and screening tests "to make a clinical diagnosis of a sick employee" was considered as generally acceptable to 47 percent of personnel officers, compared with the 48 percent of health officers who felt such a use was generally unacceptable. The survey found some differences between health and personnel officers in their perceptions of the acceptability of genetic tests for occupational health monitoring in their companies. However, the more striking finding is that companies appear to be fairly evenly split over the acceptability of using genetic monitoring and screening in the workplace for the benefit of either the employee or the employer. Regardless of the health and personnel officers interpretations of company policy, the Office of Technology Assessment (OTA) survey found no significant change from 1982 to 1989 in the number of companies using monitoring and screening (1,2).

Employer Attitudes Toward Genetic Monitoring and Screening in the Workplace

The future of genetic monitoring and screening in the workplace depends on corporate attitudes toward the use of the technology. The possibility that genetic monitoring and screening technology may

Table 4-3—Attitudes Toward Genetic Monitoring and Screening

Q.41. How do you feel about the following general statements concerning genetic screening and monitoring in the workplace? For each statement, please indicate whether you agree strongly, agree somewhat, disagree somewhat, or disagree strongly.

(Base: Health officers)

	Unweighted Base	Percent					
		Agree strongly	Agree somewhat	Disagree somewhat	Disagree strongly	Don't know[a]	No answer
It's fair for employers to use genetic screening to identify individuals whose increased risk of occupational disease poses the potential for greater costs to the employer.	(494)	17	39	15	18	*	10
The employer should have the option of deciding how to use the information obtained through genetic screening and monitoring.	(494)	15	32	19	24	*	10
The decision to perform genetic screening of job applicants and employees should be the employer's.	(494)	29	33	12	14	*	12
The decision to perform genetic monitoring of employees should be the employer's.	(494)	29	33	12	16	*	10
Government agencies should provide guidelines for genetic screening of job applicants and employees	(494)	34	27	11	18	*	10
Government agencies should provide guidelines for genetic monitoring of employees.	(494)	33	27	11	18	*	10
Genetic screening in the workplace represents a potential threat to the rights of employees.	(494)	20	38	16	15	*	11

[a]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

seriously threaten employee rights is a key concern surrounding its use. To gauge employer sensitivity to this issue, health officers were asked whether they agreed or disagreed that genetic monitoring and screening pose such a threat. The survey found that health officers were aware of the concern. Nearly 6 out of 10 (58 percent) of the health officers responding to the survey agreed with the idea that genetic screening represented a potential threat to the rights of employees (table 4-3). However, health officers were more likely to agree somewhat (38 percent) than strongly (20 percent) with the notion. Interestingly, those who reported that their companies currently employed genetic monitoring and screening were most likely (79 percent) to agree that such testing represented a potential threat to employees.

Although such testing was perceived as a potential threat to employee rights, 6 out of 10 health officers (62 percent) agreed that "the decision to perform genetic screening of job applicants and employees should be the employer's." The same proportion (62 percent) also agreed that "the decision to conduct genetic monitoring of employees should be the employer's." Most health officers felt that the employer had the right to make the decision whether or not to conduct such tests.

The basic issue in many minds, however, is not what information would be collected by genetic monitoring and screening in the workplace, but how it would be used. Earlier questions about workplace uses of genetic monitoring and screening indicated that health officers reacted more favorably to uses designed to inform employees of risk and to establish relationships between exposure and health outcomes. Hence, a somewhat more controversial use of genetic monitoring and screening was explored here.

Health officers also were asked whether they agreed that it is unfair for employers to use genetic screening to identify individuals whose increased

Table 4-4.—Cost-Effectiveness of Genetic Monitoring and Screening

Q.7. Do you think it is currently cost-effective or not cost-effective for a company like yours to:

(Base: Personnel officers)

	Unweighted base	Percent				
		Cost-effective	Not cost-effective	Not an issue[a]	Not sure	No answer
Conduct biochemical genetic tests as part of preemployment screening	(569)	3	52	1	43	2
Conduct direct-DNA tests as part of preemployment screening	(569)	1	53	1	44	2
Conduct genetic monitoring of all workers exposed to workplace hazards	(569)	8	45	1	44	2
Conduct genetic screening of workers to detect genetic susceptibilities to workplace hazards	(569)	7	45	1	45	2

[a]Volunteered response.

SOURCE: Office of Technology Assessment, 1991.

risk of occupational disease poses the potential for greater costs to the employer. A majority of the health officers (56 percent) agreed while only a third of the health officers (33 percent) disagreed. However, among those companies currently conducting genetic monitoring and screening, the majority of health officers (57 percent) disagreed with such use of genetic tests. Only 43 percent of the health officers from such companies agreed that it was fair for employers to use genetic screening to reduce their risk of costs associated with occupational disease.

Health officers were more evenly divided on the issue of who should decide how the information obtained from genetic monitoring and screening would be used. Almost half (47 percent) agreed that the employer should have the option of deciding how to use such information. Nearly an equal proportion (43 percent), however, disagreed. Current genetic testers reported a stronger opposition to this position with over half of the health officers (56 percent) from companies reporting current testing disagreeing that the employer should have the option of deciding how to use such information.

Since most health officers felt the decision to conduct genetic monitoring and screening rested with the employer, one might expect relatively little enthusiasm about a government role in the issue of genetic monitoring and screening. However, 6 in 10 health officers (61 percent) agreed with the notion that "government agencies should provide guidelines for genetic screening of job applicants and employees." Virtually the same proportion of health officers (60 percent) agreed that "government agencies should provide guidelines for genetic monitoring of employees." In companies currently using such genetic tests, the majority (71 percent) agreed that government agencies should provide guidelines in these areas.

The interest in government guidelines, however, should not be surprising given the recognition of the potential threat to employee rights raised by the technology, and the division of opinions over the proper uses of such tests. Government guidelines would fill the absence of any professional or corporate consensus on the applications, uses, and limits of genetic monitoring and screening in the workplace.

Cost-Effectiveness of Genetic Monitoring and Screening

The current economic feasibility of genetic monitoring and screening in the workplace was examined by asking personnel officers how cost-effective they considered the technology. Few corporate personnel officers believe that any of the uses of such tests is currently cost-effective. One percent of personnel officers considered the use of direct-DNA tests as part of preemployment screening currently cost-effective for their companies, and 3 percent considered the use of biochemical genetic screening tests as part of preemployment screening as cost-effective. In contrast, 52 and 53 percent of the personnel officers surveyed found that both types of testing were not cost-effective (table 4-4).

A larger percentage of personnel officers (7 percent) considered using genetic screening to detect genetic susceptibilities to workplace hazards as cost-effective. A similar proportion (8 percent) of corporate personnel officers felt it was currently

Table 4-5—Screening Conducted To Identify Persons With Increased Health Risks

Q.8a. Do you conduct *any form* of screening to identify employees or job applicants at increased risk for these jobs?

(Base: Health officers in companies where employees are exposed to workplace conditions with greater risk of negative health outcome)

Unweighted base	(180)
Yes	71%
No	25
No answer	4

SOURCE: Office of Technology Assessment, 1991.

cost-effective to conduct genetic monitoring of all workers exposed to workplace hazards. However, nearly six times as many personnel officers (45 percent) felt that such forms of genetic monitoring and screening were not currently cost-effective.

THE IMPACT OF GENETIC MONITORING AND SCREENING ON THE WORKPLACE

Screening To Identify Persons With Health Risks

Most company health officers did not believe that their employees were exposed to workplace conditions where individual susceptibilities affect the likelihood of negative health outcomes. The majority (65 percent) said that employees in their companies were not exposed to such conditions.

Only 31 percent reported that employees were exposed to workplace conditions in which individual susceptibilities affect the risk of negative health outcomes. In those companies employees are usually screened for the susceptibility. In 7 out of 10 of those companies (71 percent) some form of screening was used to identify employees or job applicants at increased risk for those jobs (table 4-5).

Medical histories represented the primary mechanism for screening employees or job applicants for individual susceptibility to workplace risk. Nearly 9 out of 10 (88 percent) of those companies reporting screening for individual susceptibility used medical histories to identify the individuals at risk (table 4-6).

Other forms of nongenetic screening were also important. Three-fifths of the companies (61 percent) conducting any form of screening for individual susceptibilities to workplace exposures reported using some form of nongenetic screening (e.g., allergy testing, lower back x-rays) other than medical histories.

Table 4-6—Types of Screening Conducted To Identify Persons With Increased Health Risks

Q.8b. Which, if any, of the following types of screening are conducted to identify increased individual susceptibility to workplace risk?[a]

(Base: Health officers in companies where screening is conducted to identify employees or job applicants at increased risk of negative health outcome)

Unweighted base	(139)
Medical history	88%
Nongenetic screening (e.g., lower back x-ray, allergy testing)	61
Genetic screening	1
None	4
No answer	3

[a]Respondents could give more than one answer.

SOURCE: Office of Technology Assessment, 1991.

Only 1 percent of health officers in companies where screening is conducted to identify employees or applicants at increased risk of negative health outcomes reported that their companies conducted genetic screening to identify increased susceptibility to workplace risk. These cases included one electric utility and one manufacturing and two nonmanufacturing companies. It is interesting to note that two of these four companies did not report genetic monitoring and screening on the other specific questions concerning genetic monitoring and screening (i.e., they were not included in the earlier estimates of the rates of genetic monitoring and screening) (1).

Overall, the survey found that genetic monitoring and screening played a limited role in identifying workplace risk. Although most companies that recognized differential employee risk used some form of screening to identify increased individual susceptibility, almost none used genetic monitoring and screening. This could indicate that, at present, medical histories and nongenetic tests are viewed as adequate to corporate needs.

Basis for Genetic Monitoring and Screening

The survey data lead to the conclusion that relatively few of the companies that responded conduct genetic tests of employees or job applicants to identify individual susceptibility to workplace conditions. The question remains, however, about what triggers genetic monitoring and screening in

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Table 4-7—Genetic Monitoring or Screening for Specific Purposes

Q.22. Has genetic screening or monitoring ever been done in your company based on:

(Base: Health officers in companies that have ever done genetic screening or monitoring)

Unweighted base	(59)
Family history	16%
Gender	9
Ethnic or racial background	19
Cofactors (e.g., smoking)	0
Job exposures	13

SOURCE: Office of Technology Assessment, 1991.

Table 4-8—Handling of Abnormal Genetic Test Results for Employees

Q.24. Is counseling offered to all employees with abnormal (positive) genetic test results by the company or are they referred to their own physicians?

(Base: Health officers in companies that have ever done genetic screening or monitoring)

Unweighted base	(59)	Excluding missing values
Company counseling	6%	9%
Referred to own physicians	44	70
Both	13	21
No answer	37	

SOURCE: Office of Technology Assesment, 1991.

the workplace. Earlier OTA survey findings suggested that a substantial portion of the reported genetic monitoring and screening in the workplace was idiosyncratic—related to individual employee requests, research projects, and the like (1,2). However, to the extent that systematic testing was being conducted, the basis of that individual testing becomes important.

A total of 59 health officers (12 percent) out of the 494 participating in the survey reported some form of past or present genetic monitoring or screening of employees by their companies. These health officers were asked about the factors considered in initiating genetic monitoring or screening in their companies. Nineteen percent of health officers in those companies reported that such testing was based on *ethnic or racial background*, as in the case of sickle cell trait. Five of the eight doing such testing had 10,000 or more employees. Workplaces in all eight companies involved employee exposure to chemicals or ionizing radiation (table 4-7).

Sixteen percent of health officers from such companies reported that their firms had done genetic monitoring or screening based on *family history*. Once again, all were from companies in which employees were exposed to chemicals or ionizing radiation and 4 of the 6 companies had 10,000 or more employees.

Thirteen percent of health officers in companies that have ever conducted genetic monitoring or screening reported *job exposures* as the basis of such testing. In all of these cases employees were exposed to chemicals or ionizing radiation. Most of the cases (10 out of 12) involved companies with 10,000 or more employees.

Only 9 percent of health officers reported that genetic monitoring or screening had ever been done on the basis of *gender*. These cases involved, once again, companies in which employees were exposed to chemicals or ionizing radiation. (Glucose-6-phosphate dehydrogenase deficiency is an example of a genetic disorder that affects only males.) Genetic monitoring or screening based on cofactors, such as smoking, was reported by none of the health officers surveyed.

How Results Are Disseminated

The corporate health officers in companies that had conducted genetic monitoring and screening of employees, regardless of the basis of the testing, were asked about the conditions under which test results were disseminated to the affected employees.

In those companies that informed employees of genetic monitoring and screening results, the survey found that the employee with abnormal test results was typically referred to his or her own physician. Over one-third (37 percent) of the health officers from companies which had ever conducted any form of genetic monitoring or screening did not respond to this question. Among health officers responding to the question, 70 percent reported that employees with abnormal findings were referred to their own physicians exclusively (table 4-8). Another 21 percent of the health officers reported that counseling was offered by the company, as well as the employee being referred to his or her own physician. The remaining 9 percent reported that the employee was given counseling by the company, with no mention of referral to a personal physician.

Table 4-9—Changes in Workplace Practice or Exposure Level Due to Results of Monitoring

Q.28. Has your company ever instituted or changed a workplace practice or exposure level due to the results of:

(Base: Health officers)

	Unweighted Base	Percent			
		Yes	No	Don't know[a]	No answer
Genetic monitoring in your own establishment(s)	(494)	1	92	*	8
Other nongenetic medical monitoring in your own establishment(s)	(494)	30	63	1	7
Genetic monitoring in another company's establishment(s)	(494)	1	91	*	7
Other nongenetic medical monitoring in another company's establishment(s)	(494)	11	81	1	7
Information published by Federal agencies, including NIOSH and OSHA	(494)	55	40	1	5

[a]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Workplace Changes

Only 1 percent of health officers said that their own genetic monitoring programs resulted in a change in workplace practice or exposure level (table 4-9). One percent also reported making such changes in their own firms on the basis of genetic monitoring results in another company.

The most common source of changes in workplace practice, however, was the Federal Government. A majority (55 percent) of the health officers reported that their companies had instituted or changed workplace practices or exposure levels due to information published by Federal agencies, including the National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA).

Treatment of Identified Risk

Since personnel officers may be in a position to use information obtained from genetic tests for personnel action, the survey asked their opinions about whether employees with identified susceptibilities should be excluded from positions of known risk.

The majority of personnel officers surveyed (58 percent) felt that the individual with genetic susceptibilities should be excluded from positions of known risk (table 4-10). On the other hand, a third of personnel officers (35 percent) believed that the employee should be allowed to take the job, if he or she waived corporate liability. In both large and small companies, only a minority of personnel officers adopted the employee choice model of handling genetic susceptibility. It should be noted that this forced choice question may not have exhausted the range of options open to employers and employees when genetic susceptibility was identified. A number of respondents objected to the starkness of the choice of answers in the question. Nonetheless, the question did help to reveal a sense of the present balance between employee rights and employer responsibility in this area.

Why Companies Have Decided Against Genetic Monitoring and Screening

In both 1989 and 1982, a number of companies that had conducted genetic monitoring or screening in the past reported that they no longer do so. The reasons companies decided to stop genetic monitoring or screening are extremely relevant in considering the future of genetic monitoring or screening in the workplace. Equally important, if not more so, are the reasons that influence companies never to begin genetic monitoring or screening of employees. Indeed, these reasons are particularly important in examining whether events between 1982 and 1989 caused those considering the use of genetic monitoring and screening in 1982 to abandon those plans.

In order to examine this issue, all health officers were asked whether their companies had considered and decided against the use of genetic monitoring or screening in the past 10 years based on their own or other companies' experiences with monitoring or screening.

Table 4-10—Exclusion or Choice: Treatment of Employees at Risk

Q.9. If an employer becomes aware that an employee has a genetic susceptibility to serious illness if he or she is exposed to substances in the workplace, do you think the employer should exclude that employee from those jobs for which he/she is at increased risk, or do you think the employer should allow the employee to take those jobs, if he/she waives corporate liability?

(Base: Personnel officers)

	Unweighted base	Percent					
		Exclude	Allow to take	It depends	Not legal [a]	Don't know[b]	No answer
Total	(569)	58	35	*	1	1	5
Type of business							
Electrical utility	(43)	52	32	0	1	0	15
Pharmceutical	(20)	50	47	0	0	0	3
Other chemical	(37)	37	50	0	0	7	6
Petroleum	(10)	63	30	0	3	0	5
Electronic	(21)	80	9	0	0	6	5
Other manufacturing	(176)	63	26	0	0	1	10
Nonmanufacturing	(262)	57	38	*	1	*	3
Number of employees							
Less than 5,000	(308)	58	36	0	1	*	6
5,000 to 9,999	(99)	55	38	1	0	1	6
10,000 or more	(154)	62	31	0	1	2	4

[a]Volunteered response including "not legal" and "cannot be done."
[b]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Two percent of those surveyed in 1989 reported that their companies had decided to discontinue or not to initiate new genetic monitoring in the past 10 years based on their own experience (table 4-11). This included one health officer who reported that genetic monitoring or screening was being currently conducted, two who reported that genetic testing was discontinued, and six health officers at companies that had never conducted genetic monitoring or screening. Three percent reported that their companies had chosen not to use genetic monitoring because of the results of genetic monitoring in another establishment.

Two percent of health officers reported that their companies had chosen not to use genetic screening based on their firms' own experiences. This included two health officers at companies that currently conducted genetic monitoring or screening, two at companies that had discontinued genetic testing and six at companies that had never conducted genetic monitoring or screening. Two percent of health officers reported that their firms had chosen not to use genetic screening because of the results of genetic screening at another company.

The results to this question suggested that experiences with genetic monitoring and screening provided only a partial explanation for why some companies chose to discontinue genetic testing. First, many of those "former testers" did not cite experiences in their own establishments or others as the reason they stopped testing. Second, a number of "current testers" indicated that they chose not to test in the past based on experiences with genetic testing, but they were apparently currently using some tests from the survey's genetic testing inventory. This suggests that the choice "not to test" may reflect decisions about individual tests or individual cases, not about biochemical genetic screening and cytogenetic monitoring in the generic sense.

More importantly, the majority of health officers in companies that never conducted genetic monitoring or screening did not cite past experiences in their own or other companies as the reason for not using genetic monitoring or screening. There seems little evidence that events or concerns about genetic monitoring or screening between 1982 and 1989 had led more than a handful of companies away from using such tests.

Personnel Officer Recommendations

Nearly 9 out of 10 personnel officers (88 percent) said that, if asked, they would recommend against the use of genetic screening as part of preemployment screening (table 4-12). Two percent of the personnel officers reported they "didn't know." Thirty-five personnel officers (6 percent) reported

Table 4-11—Reasons Companies Have Chosen Not To Use Genetic Monitoring or Screening

Q.29. In the past 10 years has your company chosen not to use genetic screening or monitoring due to the results of:

(Base: Health officers)

	Unweighted Base	Percent			
		Yes	No	Don't know[a]	No answer
Genetic monitoring in your own establishment(s)	(494)	2	86	*	12
Genetic monitoring in another company's establishment(s)	(494)	3	85	*	12
Genetic screening in your own establishment(s)	(494)	2	84	2	13
Genetic screening in another company's establishment(s)	(494)	2	84	1	13

[a]Volunteered response.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

Table 4-12—Recommendations for Genetic Screening

Q.22. If you were asked, would you recommend to your company that genetic screening be done as part of preemployment screening?

(Base: Personnel officers)

Unweighted base	(569)
Yes	6%
No	88
Don't know[a]	2
No answer	4

[a]Volunteered response.
SOURCE: Office of Technology Assessment, 1991.

that, if asked, they would recommend genetic screening be done as part of preemployment screening.

Those who would recommend genetic screening were asked to specify the criteria that the screening should be based on. The two leading criteria for recommending the use of preemployment genetic screening were predisposition to work-related illnesses (23 percent) and the cost-effectiveness of the screening (23 percent). Workplace exposure to hazardous material (19 percent) was another criterion presented. Others suggested that the screening must be based on government guidelines and consistent with laws (10 percent) (table 4-13).

The personnel officers had similar attitudes toward genetic monitoring. Nine out of ten corporate personnel officers (89 percent) said that they would recommend against periodic genetic monitoring of employees (table 4-14). Two percent "didn't know." Six percent—43 personnel officers in the sample—said they would recommend that such monitoring of employees be conducted.

Table 4-13—Criteria for Genetic Screening

Q.22. If you were asked, would you recommend to your company that genetic screening be done as part of preemployment screening? If yes, based on what criteria?[a]

(Base: Personnel officers who would recommend genetic screening)

Unweighted base	(35)
In high risk areas (unspecified)	4%
Workplace/on-the-job exposure/hazardous materials	19
Predisposition to work-related illness/hazardous to those with certain traits	23
If participation was voluntary/optional	*
Based on government guidelines/consistent with laws	10
If cost-effective/depends on cost-effectiveness	23
All other mentions	22

[a]Respondents could give more than one answer.
*Indicates less than 1 percent.
SOURCE: Office of Technology Assessment, 1991.

The two leading criteria for recommending periodic genetic monitoring were workplace exposure to hazardous material (29 percent) and the cost-effectiveness of the tests (21 percent). Other criteria included predisposition to work-related illnesses (10 percent), government guidelines (9 percent), or voluntary participation (2 percent) (table 4-15).

Health Insurance and Genetic Monitoring and Screening

The survey found that cost-effectiveness of genetic monitoring and screening influenced corporate decisions on implementing such programs. While most personnel officers in companies using genetic monitoring and screening cited cost-benefit analysis as an important factor in the decision to conduct such

Table 4-14—Recommendations for Genetic Monitoring

Q.23. If you were asked, would you recommend to your company that periodic genetic monitoring of employees be done?

(Base: Personnel officers)

Unweighted base	(569)
Yes	6%
No	89
Don't know[a]	2
No answer	3

[a]Volunteered response.

SOURCE: Office of Technology Assessment, 1991.

Table 4-15—Criteria for Genetic Monitoring

Q.23. If you were asked, would you recommend to your company that periodic genetic monitoring of employees be done? If yes, based on what criteria?[a]

(Base: Personnel officers who would recommend genetic monitoring)

Unweighted base	(43)
In high risk areas (unspecified)	4%
Workplace/on-the-job exposure/hazardous materials	29
Predisposition to work-related illness/hazardous to those with certain traits	10
If participation was voluntary/optional	2
Based on government guidelines/consistent with laws	9
If cost-effective/depends on cost-effectiveness	21
All other mentions	18

[a]Respondents could give more than one answer.

SOURCE: Office of Technology Assessment, 1991.

tests, only a small proportion considered the tests to be cost-effective.

Cost-effectiveness was not the only reason put forward against adoption of genetic monitoring and screening by employers. In addition, respondents voiced concerns about the tests' reliability and legality, the liability associated with them as well as fair and appropriate uses of the technology. Nonetheless, when one considers the survey findings of very widespread adoption of drug testing in the workplace, it seems fair to conclude that the cost-effectiveness of employee medical monitoring and screening may be more important than consensus on reliability, legality, and employee rights, in adoption of workplace tests (see ch. 2).

The survey identified one factor that could change the perceived cost-effectiveness of genetic monitoring and screening in the workplace: the health insurance risk to the employer of the employee with a genetic disease, condition, or trait. The survey

Table 4-16—Hiring of Job Applicants Considered To Be Health Insurance Risks

Q.27. If a job applicant is currently healthy and able to perform the job, but is considered to be a health insurance risk, would that consideration reduce the likelihood of his/her being hired by your company—a lot, some, or not at all?

(Base: Personnel officers)

Unweighted base	(569)
A lot	3%
Some	39
Not at all	55
No answer	2

SOURCE: Office of Technology Assessment, 1991.

provided some evidence that employers are interested in the health care risks of healthy, asymptomatic individuals, in job decisions. Moreover, a number of employers were currently screening job applicants to identify the health care risk of the applicant and his or her dependents.

It is worth mentioning that of the 565 personnel officers that responded to the survey, 24 percent purchased their current health insurance plan(s) from a private carrier, 42 percent were self-insured, and 33 percent cited both types of plans (see app. A).

The personnel officers were asked about the degree to which health insurance risk, among otherwise able-bodied job applicants, affected employment decisions. The majority of personnel officers (55 percent) reported that the health insurance risk of an otherwise healthy job applicant would not affect the likelihood of the applicant being hired by their companies. However, the survey found that in 42 percent of companies, the health insurance risk of the job applicant reduced the likelihood of an otherwise healthy, able job applicant being hired "a lot" (3 percent) or "some" (39 percent) (table 4-16).

The effect of concerns about health insurance risk on decisions about employee testing is not simply theoretical. About 1 in 10 personnel officers (11 percent) reported that the companies assessed health insurance risk of job applicants on a routine basis. Another quarter of the companies (25 percent) reported that the health insurance risk of job applicants was assessed sometimes. Hence, while 6 out of 10 companies (63 percent) reported that they never assessed the health insurance risk of job applicants, more than one-third (36 percent) reported that they did assess health insurance risk, though not necessarily on a routine basis (table 4-17).

Table 4-17—Assessing Health Insurance Risks of Job Applicants

Q.28. Does your company assess the health insurance risk of job applicants on a routine basis, sometimes or never?

(Base: Personnel officers)

Unweighted base	(569)
On a routine basis	11%
Sometimes	25
Never	63
No answer	2

SOURCE: Office of Technology Assessment, 1991.

Table 4-18—Assessing Health Insurance Risks of Dependents of Job Applicants

Q.28a. Does the health insurance assessment of job applicants also consider the health of dependents?

(Base: Personnel officers in companies that assess the health insurance risk of job applicants)

Unweighted base	(198)
Yes	9%
No	88
No answer	4

SOURCE: Office of Technology Assessment, 1991.

Perhaps even more striking is the extent to which health insurance risk was already being assessed in some large companies. Among those conducting any assessments of the health insurance risk of applicants, 1 in 10 (9 percent) companies also considered the health of dependents in the assessment (table 4-18). The responses to the preceding questions varied little between self-insured companies, companies with a private insurance carrier, and companies with both types of plans.

The growing concern among employers over the rising costs of employee health insurance, and the increased efforts to reduce those costs to the employer, are likely to increase the scope of health insurance screening in the workplace. To the extent that genetic monitoring and screening can identify employee and dependent risk to atypical subsequent health care demands, cost-effectiveness as a means of employee monitoring and screening may be increased.

The survey suggests that the cost and reliability of such tests are more of a factor than any issue of fairness. Even at this point in time, half of the personnel officers interviewed (53 percent) considered the use of a preemployment health exam in order to identify job applicants who represent high insurance risks as acceptable. If genetic tests could be used to predict risk to subsequent health conditions more reliably than medical histories and nongenetic tests, given the present climate of corporate opinion and practice related to employee screening, one would expect the new technology to be increasingly adopted as it passes a cost-effectiveness review.

It is important to keep in mind, however, that very little genetic monitoring and screening is currently being conducted by employers. The survey does not suggest that it is currently being used for health insurance screening purposes. Moreover, only a handful of companies that were not currently conducting genetic monitoring and screening anticipated doing so in the next few years. Based on the survey findings, the factor most likely to increase use of genetic monitoring or screening in the workplace is demonstrations that they can identify health insurance risks.

CHAPTER 4 REFERENCES

1. U.S. Congress, Office of Technology Assessment, *Genetic Monitoring and Screening in the Workplace*, OTA-BA-455 (Washington, DC: U.S. Government Printing Office, October 1990).
2. U.S. Congress, Office of Technology Assessment, *The Role of Genetic Testing in the Prevention of Occupational Disease*, OTA-BA-194 (Washington, DC: U.S. Government Printing Office, April 1983).

Appendixes

Appendix A
Survey Methodology

Study Design

The survey was conducted for the Office of Technology Assessment (OTA) from March 24 to July 15, 1989, by Schulman, Ronca, & Bucuvalas, Inc. (SRBI). The core of the 1989 survey remained a national survey of the 500 largest U.S. industries, 50 largest utilities, and 33 major unions. The 1989 survey contained comparable questions to core survey items from the 1982 survey. (See table A-1 for a summary of the methodology of the 1989 and 1982 surveys.)

Sampling Design

The purpose of the sampling design was to provide comparability with OTA's 1982 survey, while expanding the ability to generalize the results to a broader population. The 1989 survey results were based on four samples. First, all Fortune 500 companies were selected to provide information on genetic monitoring and screening at large corporations in the United States. The procedure for specifying this population was to use the Fortune 500 listing of manufacturers and utilities from the previous year. This procedure, which was identical to the procedure used in the 1982 survey, produced an independent census of the current Fortune 500 population rather than a panel of previously surveyed organizations.

Second, the 50 largest private utility companies in the United States were surveyed to provide coverage of large utilities. This sampling was based on the most recent *Fortune Magazine* listing prior to the survey. As with the Fortune 500 listing, this produced a current census of the 50 largest utilities.

Third, a sample of large unions was developed by OTA to provide broad coverage of a wide variety of unions. The 1982 sample of unions was based on 11 unions with the largest number of members working for Fortune 500 companies, identified from the 1979 Directory of National Unions and Employees Association published by the U.S. Department of Labor. This publication was discontinued in the early 1980s, so no comparable list was available for the 1989 survey. A broader sample of unions was desired in any case, since the 1989 survey had been expanded to include a cross-section of medium and large companies with 1,000 or more employees. Therefore, a sample of 33 large unions was identified by OTA for the 1989 survey.

Fourth, the 1989 survey added a stratified cross-section sample of large- and medium-sized companies with at least 1,000 employees that did not belong to the Fortune 500 group, to provide results projectable to the universe of companies with 1,000 or more employees. Public organizations, such as nonprofit groups and governmental organizations, were excluded. The number of employees in the company was defined as the total number of persons employed company-wide in the United States, rather than the number of employees at company headquarters or at a particular establishment.

The sample of companies with 1,000 or more employees was stratified by company size. The sample was divided into four size strata: companies with 10,000 or more employees, companies with 5,000 to 9,999 employees, companies with 2,500 to 4,999 employees, and companies with 1,000 to 2,499 employees. Companies were randomly selected within each strata from Dun & Bradstreet lists. The final sample consisted of 100 companies with 10,000 or more employees, 100 companies with 5,000 to 9,999 employees, 300 companies with 2,500 to 4,999 employees, and 350 companies with 1,000 to 2,499 employees. Such division by size allowed the survey to oversample the largest companies and obtain a relatively high sampling incidence of these firms.

Table A-1—Summary of Methodology

Samples	
Fortune 500 companies	Sampled in 1989 and 1982.
50 largest utilities	Sampled in 1989 and 1982.
Unions	30 unions in 1989 and 11 unions in 1982.
Companies with 1,000+ employees	1,000 sampled in 1989. Not sampled in 1982.
Designated respondent	
Private companies:	
Chief health officer	Designated respondent in 1989 and 1982. Received version of questionnaire for health officers.
Chief personnel officer	Designated respondent in 1989 only. Received different questionnaire version for personnel officers.
Unions:	
Union president	Designated respondent in 1989 and 1982.
Follow-up methodology	
Reminder letters	Sent in 1989 and 1982.
Remailing questionnaires to nonresponders	Sent to all nonresponders in 1989 and 1982.
Telephone followup to nonresponders	All Fortune 500 and utilities in 1989. Only 200 largest companies in 1982.
Actual telephone interviews with nonresponders to mail survey	Done as a last resort in 1989 and 1982.

SOURCE: Office of Technology Assessment, 1991.

In addition, companies with certain standard industrial code (SIC) groups were oversampled to obtain sufficient numbers of oversampled companies and permit analysis of certain types of SIC groups. The oversampled SIC code groups covered pharmaceuticals (SIC 2834), other chemical companies (rest of SIC group 28), petroleum (SIC group 29), semiconductors (SIC 3674), other electronics companies (SIC 3675-3679), and electric utilities other than the 50 largest utilities (SIC 4911 and 4931). A target subsample size of 50 companies was adopted for each of the oversampled industry groups. In order to achieve this subsample size, a sufficient number of companies with 1,000 or more employees in each oversampled group were randomly selected to supplement the core cross-section sample so that the final sample included 50 companies in the oversampled group. In cases where there were 50 or less U.S. companies in an oversampled group with 1,000 or more employees, all companies in that group with 1,000 or more employees were included in the final sample.

Questionnaire Development

A survey questionnaire was developed by the contractor in concert with OTA according to the detailed research objectives set forth by OTA. The OTA advisory panel reviewed the questionnaire at the February 1989 panel meeting after a pretest was conducted between February 17 and March 1, 1989. The findings of the pretest were used to revise the questionnaire.

The 1989 survey contained comparable questions to core survey items from the 1982 survey. This provided OTA with the necessary comparability to the 1982 survey so that changes in the workplace over time could be assessed. However, the method was altered to increase the usefulness of the information. The central components were:

1. The content of the questionnaire was broadened to include the use of genetic monitoring and screening in the workplace in the context of other types of employee testing. The survey was expanded to deal with attitudes of employers toward the proper and improper uses of genetic monitoring and screening in the workplace. The survey also covered more areas related to the applications of genetic monitoring and screening in personnel matters, as well as applications for employee health.

2. As in 1982, the survey was directed to the chief health officer, to answer questions dealing with the medical applications of genetic monitoring and screening. A different questionnaire was also directed to the chief personnel officer focusing on personnel applications (e.g., recruitment, placement, advancement, and retention) of genetic monitoring and screening.

3. The universe of Fortune 500 companies was supplemented by a sample of non-Fortune 500 large-and medium-sized employers so that the extent of genetic monitoring and screening in the workplace could be examined more broadly.

4. Telephone recontact was attempted with all nonrespondents in the Fortune 500 and 50 largest utility companies.

5. The identity of companies returning questionnaires was anonymous in 1982. In order to improve tracking of the sample and prevent duplicate responses, the 1989 survey used questionnaires with identification numbers on peel-off labels. The respondent was encouraged to leave the label on the questionnaire when it was returned, but this was voluntary. All labels were removed after receipt of the questionnaires, making the data both anonymous and confidential.

Confidentiality

The 1982 survey used a postcard system to verify which companies had returned questionnaires. Each questionnaire was sent to the company along with a postcard. Substantially more questionnaires were returned (n=373) than postcards (n=307). This raised the possibility that more than one survey was completed by the same organization, since respondents are normally more likely to return a postcard without a questionnaire, so that he or she would not be subject to follow-up. In fact, a few organizations returned more than one questionnaire in 1989, i.e., the original questionnaire and a questionnaire sent in a follow-up mailing. These were identified and removed from the 1989 sample.

Because there appeared to be a problem with the use of a separate postcard to track anonymous questionnaire returns, a respondent identification number was proposed for the 1989 questionnaires. This permitted improved sample tracking and allowed identification of duplicate returns. Due to concerns about the anonymity of the questionnaires, a compromise solution was to affix the identification number to the 1989 questionnaires on a peel-off label that could be removed by respondents who wished to remain anonymous. Respondents were encouraged to leave the peel-off label on the survey, which explained would be removed after receipt. After SRBI received the questionnaires, the peel-off labels were removed, making the data both anonymous and confidential.

Nine out of 10 survey participants left the peel-off label on the questionnaire. The peel-off labels were removed from 11 percent of the health officer questionnaires, and 10 percent of the personnel officer questionnaires returned to SRBI. Only 5 of 59 health officers reporting any type of genetic monitoring and screening removed the label before returning it.

Table A-2—Sample Disposition for 1989 Survey: Fortune 500 and 50 Largest Utilities

Sample mailing and eligibility	Number
Drawn sample	550
Companies ineligible before mailing: merged/out of business/bought by other company in sample	3
Companies mailed questionnaires	547
Companies ineligible to complete survey	18
Merged/out of business/bought by other company in sample	15
Noncontactable by mail and telephone, no forwarding address and nonlocatable	3
Companies eligible to complete survey	529
Participation in survey	
Total questionnaires received during field period	453
Health questionnaires received	250
Personnel questionnaires received	203
Companies returning at least one questionnaire during field period	325
Companies returning both questionnaires	128
Companies returning only health questionnaire	122
Companies returning only personnel questionnaire	75
Companies returning questionnaires after close of field period	5
Total companies returning questionnaires	330
Nonparticipation in survey	
Companies refusing to participate	150
Too busy to complete survey	41
Participation against company policy	51
Company too decentralized for someone to do survey	5
Other refusals	53
Companies in callback status: had been remailed questionnaires	45
Other companies not returning questionnaires	4
Completion rate (Total companies returning questionnaires/eligible companies)	62.4%

SOURCE: Office of Technology Assessment, 1991.

Table A-3—Sample Disposition for Survey: Non-Fortune 500 Companies

Sample mailing and eligibility	Number
Drawn sample	1,039
Companies ineligible before mailing: merged/out of business/bought by other company in sample	0
Companies mailed questionnaires	1,039
Companies ineligible to complete survey: merged/out of business/bought by other company in sample	40
Companies eligible to complete survey	999
Participation in survey	
Total questionnaires received during field period	667
Health questionnaires received	301
Personnel questionnaires received	366
Companies returning at least one questionnaire during field period	460
Companies returning both questionnaires	207
Companies returning only health questionnaire	94
Companies returning only personnel questionnaire	159
Companies returning questionnaires after close of field period	10
Total companies returning questionnaires	470
Nonparticipation in survey	
Companies refusing to participate	22
Companies requesting mail to different address	19
No response after 2 mailings	488
Completion rate (Total companies returning questionnaires/eligible companies)	47.0%

SOURCE: Office of Technology Assessment, 1991.

Field Procedures

The field procedures used in this study included:

- an advance letter, produced on OTA stationery and signed by OTA Director, John H. Gibbons, sent to the Chief Executive Officer (CEO) of each sampled company and union Presidents prior to mailing the questionnaire;
- a first mailing of the questionnaire with a cover letter to the CEO, asking that one questionnaire be directed to the firm's chief executive for health affairs and a second one to the chief personnel officer;
- a follow-up letter to individuals whose replies were not received within 2 weeks of the first mailing;
- a second questionnaire mailing approximately 3 weeks after the follow-up letter;
- a telephone follow-up of all Fortune 500 companies and the 50 largest utility companies that did not return both questionnaires; and
- telephone interviews after repeated telephone follow-up and remails.

Sample Disposition

A total of 330 organizations in the Fortune 500 and 50 largest utilities categories completed and returned at least one questionnaire for the 1989 survey (table A-2). An additional 21 organizations in these groups were classified as ineligible for the survey because they had merged, were no longer in business, or had been bought by another Fortune 500 company or by one of the 50 largest utilities. **The overall response rate among the 529 eligible organizations was 62.4 percent.**

By comparison, the 1982 survey on genetic monitoring and screening reported a 65.2 percent response rate among the Fortune 500 companies, 50 largest utilities and 11 unions, based on 366 organizations returning questionnaires. One four-page questionnaire was mailed to CEO's and directed to chief health officers in 1982. In 1989, two questionnaires totaling 20 pages were mailed to CEO's, including a 12-page instrument for chief health officers and an 8-page questionnaire for chief personnel officers.

The 62.4 percent response rate was achieved after repeated follow-up telephone calls and remails of the

questionnaires. A total of 150 companies refused to participate in the 1989 survey, or 28 percent of the Fortune 500 companies and 50 largest utilities.

A total of 470 additional organizations from a national sample of non-Fortune companies with 1,000 or more employees completed and returned at least one questionnaire for the 1989 survey. No telephone followup efforts were conducted among this additional sample because response rate comparability was not sought. Hence, the response rate to the survey was somewhat lower among the additional sample of non-Fortune companies with 1,000 or more employees (47 percent) than was achieved among the Fortune companies (62.4 percent).

Both Fortune and non-Fortune samples represent proper and exclusive subsets of the universe of companies with 1,000 or more employees. However, since the sampling was conducted disproportionately by company size and industry classification, the completed sample was weighted to the population distribution of the universe on these two characteristics. The tables present the weighted sample proportions, along with the unweighted sample sizes.

Appendix B

Qualitative Comments About the Survey

Space was provided on the last page of all questionnaires for respondents to volunteer any opinions, concerns, or suggestions related to genetic monitoring and screening in the workplace that they felt the survey did not address. In addition, respondents were encouraged to comment on any survey questions they found confusing or difficult to answer. A total of 78 health officers and 50 personnel officers volunteered comments on the last page of the questionnaire. Most comments volunteered dealt with views on the subject of genetic monitoring or screening. A handful volunteered criticism of the survey or qualified answers to individual questions.

The open-ended comments of survey participants provide additional detail and context on current attitudes and concerns among employers about the use of genetic monitoring and screening in the workplace. Although they may qualify individual responses, the comments are consistent with the quantitative findings of the survey.

Comments on Genetic Monitoring or Screening

Health and personnel officers who volunteered comments offered much more criticism than support for genetic monitoring and screening. However, several indicated that monitoring and screening may be acceptable under certain circumstances. Many of those critical of such testing objected more on practical than philosophical grounds. No health or personnel officer volunteered comments dealing with corporate plans to implement genetic monitoring or screening in the future.

Support for Monitoring or Screening

No health officer volunteered comments giving unqualified support to genetic monitoring and screening. The health officer who gave the most supportive statement regarding genetic monitoring or screening wrote the following:

> Genetic testing is an excellent clinical tool. It is very sensitive and very specific, but is not practicable when you try and relate an abnormality to workplace hazards.

Another health officer wrote:

> I support any mechanism which would protect the health and safety of our employees. I feel employees should be well informed and the business should have a responsibility for providing a safe working place.

The two personnel officers who volunteered the most supportive comments of genetic monitoring or screening wrote:

> I am of the opinion that genetic screening is the answer to protection from occupational disease for the individual and for liability control for the employer. I am an occupational health professional, and a minority, in a Fortune 500 firm that has difficulty condoning preemployment physicals. It will take OSHA [Occupational Safety and Health Administration] to cause it to happen here!

> Genetic monitoring or testing can be a valuable tool for both the individual and the company. Neither party is well served by an inappropriate employment situation. There are times, of course, when it may be difficult for certain high-risk individuals to be employed in almost any situation; that issue is a moral and ethical one that does require further study. As indicated in an earlier response, if genetic technology is better perfected, laws are not prohibitively restricted and if society accepts the concept, I would feel that genetic monitoring and testing will occur with more frequency in the future.

Qualified Views on Genetic Monitoring or Screening

However, a number of health officers suggested that guidelines would need to be established for genetic monitoring or screening, with some calling for the development of guidelines as a prerequisite for their companies to consider the use of genetic monitoring or screening. One health officer stated that access to any employee medical information is a very sensitive area for which some guidelines would be helpful. Comments by health officers who volunteered support for genetic monitoring or screening guidelines are given below:

> Because of the nature of the subject it is imperative that guidelines, legality, and accuracy of genetic screening and monitoring be well established before our company would consider the use of these tools.

> Monitoring should be done only on established guidelines affecting usage. More research is needed in this area before proper implementation can be done.

> Collecting data is not problematic. The important and often controversial topic is how that data is used. Genetic information is often not as useful as some may believe, therefore stringent guidelines on how the data may be used should be developed.

> Guidelines are needed before testing. Employer and employee must work this testing out together unless it is mandated.

> Our industrial exposures are unrelated to illness identifiable with known genetic-related factors. However, unless safeguards are available to protect genetically vulnerable employees it would be appropriate to identify them for proper placement.

Too much work remains to be done at the biomolecular and biochemical level to elucidate the association between genetic testing and specific syndromes, deficiencies or disease states, i.e., elucidate the associations with an acceptable accuracy. Additional R&D should proceed because there are many potential benefits to health promotion and protection, provided a suitable educational program is developed in tandem: one that explains the issues in realistic terms. . . .

Genetic screening and monitoring viewed as primarily a *research* tool at this time.

Key questions or concerns: Testing has to be related to job performance and be documented by objective studies or at least consensus expert opinion. All reasonable (e.g., as OSHA defined) steps to alter jobs should be carried out before applicants are excluded from them. In this state, *any* condition affected by the workplace, even minimally, is fully compensable. That puts extra incentives on business if we are held financially responsible for a minimal aggravation of an at-risk employee's condition.

I favor genetic testing only if such a test would identify an individual at risk of developing a significant illness if exposed to a particular agent in the workplace.

Genetic screening or monitoring would be considered for use if justified to prevent or monitor occupational illness but *only* if it met criteria applied to nongenetic tests. Criteria would include cost, scientific validity, and ethical considerations.

Genetic screening and monitoring is a technique that can now be used to assess and warn an employee of potential harm greater than the general workforce, but should not be used at this time to displace workers or deny employment.

A number of personnel officers volunteered comments on genetic monitoring or screening that can be classified as qualified views on the subject. Like the health officers who supported the development of guidelines, some of these personnel officers indicated the tests may be usable under certain circumstances:

While I believe it to be generally inappropriate to test, I believe that some specific risks dictate wise use of screening.

Definitely can have its value in appropriate (high risk—you define) industries; e.g., chemical. Probably not appropriate—or "cost-effective"—in the great majority of industries. Obvious potential for serious misuse—perhaps, even abuse.

We believe genetic testing may develop into a very valuable human resource management tool as well as an important guide for personal career and life planning for individuals; we are concerned about the potential social/political (mis)use of the information.

Genetic screening presents a real dilemma in that it can aid in the protection of employees and employers by minimizing exposure to what, for some, are hazardous conditions. If in this context it is used to match people and jobs there is nothing wrong with it. If on the other hand genetic testing is used to simply exclude people from employment, it doesn't really solve the problem at all. It just swaps one for another.

Only in very select situations can genetic monitoring/counseling/screening be justified as a corporate expense. Even then the individual must be allowed some degree of "free" choice provided that he/she will accept responsibility for the outcome.

I feel to have knowledge of genetic tests incurs a liability on the employer that goes far beyond the employee/employer relationship. Our role is to focus on job performance. Other issues that don't effect that are none of our business. However, we are also concerned with helping our employees stay healthy so they can be productive.

Provided employment/employability is totally a function of the ability to do the job—then *any* testing that would document that the job assignment is a health risk is appropriate. But *only* to exclude a specific assignment—not to exclude employment.

Genetic screening and monitoring activities should only be used when there is a clear expectation of what will be done with the results, i.e.,—there is a *specific* treatment. If information/purpose has *not* been proven, then telling an employee that he/she has an "abnormal" test (and no one knows what to do with it) only leads to a feeling of hopelessness and suspicion on the part of the employee who holds the employer liable for any possible outcome. Unless the program of screening has been proven, then any data collected should be considered a *research project* and information *not* given to employees unless done in such a way that *no one* is held liable for outcomes. It is not fair to hold employers liable for *unknown outcomes* (known outcomes is a different issue). Standard research protocols should be used and rigorously assessed—if not will have the same problem as when the AIDS [acquired immunodeficiency syndrome] test was inappropriately first released.

Criticisms of Genetic Monitoring or Screening

Health officers volunteered several general criticisms of genetic monitoring or screening, including explanations of why such tests were not being conducted. The criticisms of genetic monitoring or screening focused on the perceived lack of practical value and accuracy of the tests; possible problems with actual or perceived discrimination stemming from using genetic monitoring or screening; and even possible abuse of the tests. It should be noted that some of those offering reservations or opposition to genetic monitoring or screening based their objections on primarily practical grounds.

Health officers objecting to genetic monitoring or screening tests as potentially discriminatory or unethical wrote the following:

On a theoretical, altruistic level, I can see the advantages of genetic screening and monitoring; however, on a practical level the potentials for abuse far outweigh the advantages. Furthermore, with a shrinking workforce in

the years to come, such testing would increase the costs of products tremendously.

At present, our corporation has a good risk assessment and reduction program. Any genetic pre- or post-screening is not envisioned. Any genetic monitoring during employment would be viewed as potentially discriminatory and against all corporate philosophy.

I have grave reservations as to whether our medical-legal-social-financial structure can deal rationally to genetic screening and/or monitoring. Our track record regarding women and minorities gives me little comfort to believe we could handle a genetic tool in the workplace.

The more testing that is done results in more chances of denying an applicant employment because they can't be placed. This then is often grieved as discrimination. How do you propose to handle this 'Catch 22' situation?

I find the concept of genetic screening as a workplace requirement inappropriate at best and abhorrent at worst. It is a sad commentary on the state of our national ethics.

Genetic screening must never be used to select for those capable of withstanding environmental conditions, as an alternative to making the workplace safe for everyone (or most workers).

Current law requires employers not to discriminate in hiring the handicapped. I assume this includes the use of genetic testing.

Similarly, some health officers noted that genetic monitoring or screening could pose problems related to individual rights:

We must be ever vigilant that individuals are not disadvantaged because of their heredity or environmental circumstances.

In theory business programs involved in using genetic screening and monitoring would appear to be helpful; however, with the present wave of citizens involving themselves with individual rights such programs could present many problems . . . There are few people now who are not aware of their familial health problems and their potential for developing such problems themselves . . . .

Genetic screening and monitoring seem to be in direct conflict with the Rehabilitation Act, etc.

Other health officers objected primarily to the perceived lack of practical value of genetic monitoring or screening:

We do not believe the science pertaining to genetic testing is sound enough at this time. Strong consideration of the value of genetic testing is contingent on the reliability of the tests. This testing is not reliable currently.

In the future genetic screening will be sufficiently developed technically to apply as a screening tool. Not yet. Biggest problem is absence of studies correlating findings with health outcomes.

At the present time I have no confidence in state-of-the-art genetic testing and/or interpretation of test results.

You will observe from my responses that I have an objection IN PRINCIPLE with many aspects of genetic screening or monitoring. However, the reason my company has not and does not plan to implement such procedures in the future is that the state-of-the-art, validity of interpretation of many of the tests is still unclear . . . .

Genetic testing does not currently appear to have much practical value in protecting persons or reducing their risk of harm. We have no moral or ethical opposition to testing that is useful in promoting health. If we had full testing of all employees, placement would be about as it is now.

We do have exposures to mutagenic agents. However, consultation with our genetics department reveals the conditions mentioned in question 2 above are not presently met. Such testing has no merit; the goals are achievable by conventional industrial hygiene measures.

Personnel officers also offered a range of criticisms of genetic monitoring or screening. A number were strongly opposed to conducting genetic monitoring or screening:

I believe that genetic testing for any reason is morally wrong and an infringement on privacy rights. I have a fear it will lead to a 'super race' philosophy. Our country was founded on principles of privacy, equal rights. I feel this is a step to destroy those rights. The only exception to this is if it violates safety rules.

From a personal, professional and employee relations point-of-view, I would *oppose any* form of genetic screening and/or testing!!!! A total and complete invasion of privacy!!

I don't believe the efficacy or reliability of genetic testing is sufficiently proven to warrant mandated genetic testing programs. I have concerns about the abuse of testing results which potentially could involve employers in areas beyond their need to know resulting in invasion of privacy, employment discrimination, scaring employees with incomplete or incorrect medical information.

Genetic screening belongs in Star Wars. To our knowledge, no reliable cost-effective screening exists for such screening.

I think that genetic testing is too new a concept for us to properly evaluate. It conjures images of the "dark" side of science. If it is appropriate, much is needed by many of us in the way of understanding the implications.

There would be a reluctance to make employment decisions based on genetic testing because of antidiscrimination laws.

We are unaware of the use/benefit of such testing. I am sure cost considerations and EEO [equal employment opportunity] (handicap) legislation could be problem.

You should consider the impact of screening as another possible cause for discrimination in the workplace, and the cost of such screenings to the employer.

What is the reliability level of this type monitoring/screening? What are the costs? Since I am unfamiliar with the efficacy of such tests my perception is shaped by a "Star Wars" image. You have also not asked questions about privacy and legality and conflict with handicap antidiscrimination laws.

I'm not familiar with genetic testing but would be concerned about legal issues that will inevitably arise.

I have a problem with the morality of such testing—"Big Brother" is too much a part of our lives already. Carry genetic engineering to its logical conclusion, and we'll be breeding engineers, MD's, research scientists, etc., like we breed race horses.

I wonder if the collection of this type of data doesn't ultimately lead to further unnecessary government intrusion into the workplace!

The use of genetic monitoring/screening will become more evident when the results and studies can be directly linked to the prevention or reduction of liability in the workplace. The current use of genetic testing does not appear to be 'socially' acceptable and will require education of employers either through insurance companies or legislative initiatives.

I am decidedly against genetic interference. Products should be designed with humans in mind not vice versa.

Comments on the Lack of Information About Genetic Monitoring or Screening

Several health officers stated that they lacked information on genetic monitoring or screening. One attributed the paucity of information to the technology's newness. This person said that the company should do everything reasonable to protect the employee and, "must change attitude of public that this is an invasion of privacy any more than a H&P [History and Physical]." Others wrote:

Not enough information available to me to know value and costs of genetic evaluations.

A most difficult area.

We have not as yet seriously considered or researched the matter of genetic screening/monitoring.

It's never been discussed as an option in our company.

Genetic screening does not apply to this industry.

Considering our type of operation this has little relevance to us.

Similarly, one personnel officer reported working for a very sophisticated employer who lacked experience with the subject. Other personnel officers wrote that:

The entire area of genetic testing in the workplace is a new one and one which has not been widely discussed or presented in HR [human resources] type publications. I feel a total educational process will be required.

We have not, as a company, explored the ethical and/or philosophical considerations of genetic testing.

Difficult to respond because of a lack of information regarding genetic and biochemical testing.

It's difficult to answer many of the questions when I have little or no knowledge of biochemical genetic screening, cytogenetic monitoring or DNA-based screening or monitoring techniques.

At this point in time I do not possess enough information or knowledge with respect to genetic screening to make informed judgments or recommendations to corporate management.

Need to know a great deal more about this type of testing.

Many compensation/benefits practitioners will need more information on genetic testing and how it would be administered before they can provide meaningful input on this topic.

At this point we have not made an intensive examination of the issue of mandatory testing of the type(s) outlined in this questionnaire. We will continue to review this issue in future Benefit/Health committee meetings held at the management level of the company.

Some difficulty in truly understanding the specific testing suggested and scope because of the huge controversy re: genetic testing and implications of judgments and decisions which might be made re: results, discrimination, etc.

General Comments on Testing

Two health officers wrote that any practical tests that would identify applicants or employees at greater health risk would be helpful, with one stating "all practical technology" should be employed. One health officer simply stated support for proceeding deliberately to protect employees and companies. One personnel officer volunteered opposition to medical testing that attempts to limit an individual's employment on the basis of predisposition or susceptibility to a specific medical condition, although that officer noted some use of tests in hazardous job environments. Another personnel officer volunteered opposition to additional Federal legislation to cover any additional testing, national health care and/or the employment of persons with physical limitations.

Comments on the Survey

Several health officers volunteered comments on the last page of the survey that explained or modified their answer to specific questions. One explained cytogenetic monitoring was not conducted because the technology was considered unsatisfactory. Two felt that "exposure" means the potential for exposure, with one volunteering

that chest x-rays are not usually required and that rotating employees to prevent exposures was not necessary in most instances. One health officer wrote this comment to explain how the company performs genetic screening:

> The only genetic screening we perform is to diagnose; such as for sickle cell disease/trait, or thalassemia or G-6-PD [glucose-6-phosphate-dehydrogenase] deficiency to aid us in the diagnosis of an anemia. The only blood test performed on our preemployment form is hemoglobin/hematocrit/white blood cell count.

This was the only comment volunteered by a health officer dealing with actual use of genetic monitoring or screening.

In addition, a number of health officers volunteered criticisms of the questionnaire or found some items difficult to answer, including two with objections that the questionnaire contained questions that were poorly worded, simplistic, loaded, and skirted the law on affirmative action. For example:

> Many of the survey questions are difficult to answer yes or no. There are questions of definitions that apply to almost all.

> Some questions were left unanswered mainly due to lack of understanding of the terminology involved.

> Some questions difficult to understand.

One health officer wrote that broader answers are needed on questions dealing with workplace exposures. One found the attitudinal questions difficult primarily because they did not take "good faith efforts" at accommodation into account. One health officer wrote that one question (Q.29) is confusing and had some "ambivalence" about some of the general attitude items because genetic monitoring or screening was "not bad *per se*" but there was "a potential for misuse."

In addition, one health officer commented that positive genetic tests do not translate into poor performance. This person wrote that such tests were not totally accurate, but were discriminatory. Finally, one respondent wrote that "care must be taken in interpreting and conveying the results of the survey responses."

Several personnel officers also volunteered criticisms of the survey or offered criticisms to individual questions. Two personnel officers called the survey a waste of money and one thought the questionnaire assumed a higher level of sophistication than corporations have. One personnel officer reported difficulty in answering some questions because of a lack of information on the costs associated with genetic testing. Two objected to the way question 9 was framed, including one who wrote that the answers to question 19 are inappropriate. One stated that questions regarding "risk" were vague and made suggestions for related concepts that should have been included.

Two respondents to the health officer questionnaire noted that their companies have no health officer. One health officer indicated that the company is decentralized, so the answers might not reflect company policy, while one personnel officer simply noted that the organization was highly decentralized. Finally, one health officer indicated that the survey was difficult to fill out because the scope of the "company" was not easily defined.

Appendix C

Acronyms and Glossary of Terms

List of Acronyms

AIDS	—acquired immunodeficiency syndrome
CDC	—Centers for Disease Control (PHS, DHHS)
DHHS	—U.S. Department of Health and Human Services
DNA	—deoxyribonucleic acid
DOL	—U.S. Department of Labor
EEO	—equal employment opportunity
EKG	—electrocardiogram
G-6-PD	—glucose-6-phosphate dehydrogenase
HIV	—human immunodeficiency virus
HR	—human resources
NIOSH	—National Institute for Occupational Safety and Health (CDC, PHS, DHHS)
OSHA	—Occupational Safety and Health Administration (DOL)
OTA	—Office of Technology Assessment
PHS	—U.S. Public Health Service (DHHS)
SIC	—standard industrial code
SRBI	—Schulman, Ronca, & Bucuvalas, Inc.

Glossary of Terms

Acquired immunodeficiency syndrome: The most severe clinical manifestation of immune dysfunction caused by the human immunodeficiency virus (HIV).

Biochemical genetics: The analysis of mutant genes on the basis of altered proteins or metabolites.

Chromosome: A threadlike structure that carries genetic information arranged in a linear sequence. In humans, it consists of a complex of nucleic acids and proteins.

Cytogenetics: The study of the relationship of the microscopic appearance of the chromosomes and their behavior to the genotype and phenotype of the individual.

Deoxyribonucleic acid (DNA): The molecule that encodes genetic information. DNA is a double-stranded helix held together by weak bonds between base pairs of nucleotides.

DNA: See *deoxyribonucleic acid.*

Genetic monitoring: Involves periodically examining employees to evaluate modifications of their genetic material—e.g., chromosomal damage or evidence of increased occurrence of molecular mutations—that may have evolved in the course of employment. It ascertains whether the genetic material of the group of individuals has altered over time.

Genetic screening: A process to examine the genetic makeup of employees or job applicants for certain inherited characteristics. It can be used to detect occupationally and nonoccupationally related traits.

Genetic testing: Technologies that determine a person's genetic makeup or that identify changes (damage) in the genetic material of certain cells. As used in the workplace, it encompasses both genetic monitoring and screening.

Human immunodeficiency virus (HIV): A retrovirus that is the etiologic agent of AIDS.

Mutagen/mutagenicity: A substance capable of inducing a heritable change in the genetic material of cells.

Reliability: Measured by the ability of a test to accurately detect that which it was designed to detect and to do so in a consistent fashion.

Trait: A distinguishing feature; a characteristic or property of an individual.

Validity: The extent to which a test will correctly classify true susceptible and true nonsusceptible individuals; sensitivity and specificity are components of validity.

Appendix D

Survey Instrument: Corporate Health Officers

SURVEY OF WORKPLACE HEALTH AND GENETIC SCREENING AND MONITORING

CORPORATE HEALTH OFFICER VERSION

The Congressional Office of Technology Assessment is conducting a national survey of the opinions and experiences of employers related to the use of genetic screening and monitoring in the workplace. This questionnaire has been directed to you as the person in your organization whose responsibilities include employee health. We need your assistance in answering, as best you can, some questions about workplace testing and employee health in your company.

For the purposes of this survey and the subsequent report, OTA has adopted the following definitions. By genetic monitoring, we mean periodically examining employees to evaluate modifications of their genetic material via tests such as cytogenetic or direct-DNA tests. By genetic screening, we mean screening job applicants or employees for certain inherited characteristics. Screening tests may be biochemical tests or direct-DNA tests. They can be used to indicate a predisposition to an occupational illness if exposed to a specific environmental agent, or they could be used to detect any inherited characteristic such as Huntington's disease. In contrast to periodic monitoring, screening tests are generally performed only one time per characteristic.

This is an important study, which has been requested by the Congress of the United States, designed to represent the opinion and experience of the employer. We need to know how employers view the technologies of genetic screening and monitoring in terms of their current and future applications to the workplace. We also want to know how these technologies are seen in the broader context of more common forms of employee health screening and monitoring in the workplace.

Your responses are very important, regardless of whether you have had any experience with genetic screening or monitoring. If your company has never explored the technology, the questionnaire will only take ten minutes. If you have some experience with the technology, it may take a little longer to complete the questionnaire. In either case, your experiences and opinions will help to inform congressional opinion about this area.

Please read each question and mark the box(es) that most nearly corresponds to your answer. After each answer continue with the next question unless there is an instruction to skip to a particular question. Please feel free to qualify your answers, if you feel it is necessary. Space has been provided at the end for comments and opinions that you feel are not adequately represented by the survey questions.

You are free to decline to answer any questions that you consider inappropriate. The questionnaire and any identifying information will be destroyed after data entry, so that all responses will be anonymous as well as confidential.

1. In your company, are pre-employment health examinations required of all, most, some, few, or no job applicants?

☐ All ☐ Most ☐ Some ☐ Few

☐ None ——→ *SKIP to Q.6*

2. Would your company consider it acceptable or unacceptable to conduct a pre-employment health examination in order to:

	ACCEPTABLE	UNACCEPTABLE
Identify job applicants who are physically unfit for employment	☐	☐
Identify job applicants who are emotionally or psychologically unstable	☐	☐
Identify job applicants who are currently using drugs	☐	☐
Identify job applicants who are at increased risk to workplace hazards	☐	☐
Identify job applicants with genetic susceptibility to workplace exposures	☐	☐
Identify job applicants who represent high insurance risks	☐	☐

3. Which of the following are normally part of the pre-employment examination in your company for non-administrative positions? *(MARK ALL THAT APPLY)*

Personal medical history ☐	Chest X-ray ☐
Family medical history ☐	Pulmonary function test ☐
Simple physical examinations ☐	Eye and hearing exam ☐
Standard blood chemistry tests ☐	Urinalysis for drug use ☐
EKG ☐	Lower back X-ray ☐

4. Which of the following types of results of pre-employment examinations would normally be released to job applicants?

- Normal results (negative findings) ☐
- Positive findings already indicated in medical history ☐
- Positive findings not reflected in medical history ☐
- Positive findings which disqualify them for employment ☐
- Positive findings which affect position/site eligibility ☐
- All of the above ☐
- None ☐ → *SKIP TO Q.6*

5. How would that information normally be released to job applicants?

☐ Letter ☐ Consultation with medical staff ☐ Both ☐ Other

6. **Are there any specific medical criteria, other than those mandated by regulation, that would exclude individuals from eligibility for certain positions, jobs or sites in your company (e.g., hypersensitivity to dust or platinum, pregnancy)?**

☐ Yes ☐ No ——→ *SKIP TO Q.7*

6a. **Which medical criteria would exclude employment in which jobs?**

Medical Criteria	Excluded Position/Job/Site
1. _____	_____
2. _____	_____
3. _____	_____

7. **Are any employees in your company exposed to chemicals or ionizing radiation in the workplace setting?**

☐ Yes ☐ No ——→ *SKIP TO Q.8*

7a. **Are those employees who are exposed to chemicals or ionizing radiation routinely rotated to avoid prolonged exposure?**

☐ Yes ☐ No

7b. **Does your company conduct any form of medical surveillance of employees whose job may expose them to environmental health risks, other than testing required by OSHA?**

☐ Yes ☐ No

8. **Are any employees in your company exposed to any known workplace condition where there is a greater risk of negative health outcome, depending upon individual susceptibilities?**

☐ Yes ☐ No ——→ *SKIP TO Q.9*

8a. **Do you conduct <u>any form</u> of screening to identify employees or job applicants at increased risk for these jobs?**

☐ Yes ☐ No ——→ *SKIP TO Q.9*

8b. **Which, if any, of the following types of screening are conducted to identify increased individual susceptibility to workplace risk?**

☐ Medical History ☐ Non-genetic screening (e.g., lower back X-ray, allergy testing) ☐ Genetic screening ☐ None

9a. As part of ongoing worker health evaluation does the company require, as a condition of continued employment, all employees, only those in certain plants or jobs, only employees with certain medical conditions or histories, or no employees to have:

9b. Which of these tests (in Q.9a-g), if any, do you offer to employees on a voluntary basis as part of a corporate wellness program?

	Q. 9a REQUIRE				Q. 9b	
	ALL	PLANTS/ JOBS	CONDITIONS/ HISTORIES	NONE	OFFER YES	VOLUNTARY NO
a. Routine physical examination....	☐	☐	☐	☐	☐	☐
b. Test for hypersensitivity.....	☐	☐	☐	☐	☐	☐
c. Hearing tests.....	☐	☐	☐	☐	☐	☐
d. Pulmonary function tests.....	☐	☐	☐	☐	☐	☐
e. Vision tests.....	☐	☐	☐	☐	☐	☐
f. Chest X-rays.....	☐	☐	☐	☐	☐	☐
g. Blood chemistry tests.....	☐	☐	☐	☐	☐	☐

10. Would your company consider the use of genetic screening or monitoring of employees or job applicants as generally acceptable or generally unacceptable to:

	GENERALLY ACCEPTABLE	GENERALLY UNACCEPTABLE
Make a clinical diagnosis of a sick employee.....	☐	☐
Establish links between genetic predisposition and workplace hazards.....	☐	☐
Inform employees of their increased susceptibility to workplace hazards.....	☐	☐
Exclude employees with increased susceptibility from risk situations.....	☐	☐
Monitor chromosomal changes associated with workplace exposures.....	☐	☐
Establish evidence of pre-employment health status for liability purposes.....	☐	☐

11. Does your company have a formal policy related to the use of genetic tests in the screening of job applicants or employees?

☐ Yes ☐ No

12. Does your company have a formal policy related to the use of genetic tests in the monitoring of employee health?

☐ Yes ☐ No

The following questions concern biochemical genetic screening and/or cytogenetic monitoring that may have been conducted by your company on one or more employees or job applicants. By conduct we mean perform, contract for, or arrange for the test as part of a routine or ongoing program.

13. **Is your company currently conducting biochemical genetic screening of any employees or job applicants, for research or any other reason?**

☐ Yes ☐ No ☐ Not Sure

14. **Has your company conducted any biochemical genetic screening of any employees or job applicants, for research or any other reason in the past 19 years?**

☐ Yes ☐ No ☐ Not Sure

15. **Is your company currently conducting cytogenetic monitoring of any employees or job applicants, for research or any other reason?**

☐ Yes ☐ No ☐ Not Sure

16. **Has your company conducted any cytogenetic monitoring of any employees or job applicants, for research or any other reason in the past 19 years?**

☐ Yes ☐ No ☐ Not Sure

17. **Is your company currently conducting direct-DNA screening of any employees or job applicants, for research or any other reason?**

☐ Yes ☐ No ☐ Not Sure

18. **Is your company currently conducting direct-DNA monitoring of any employees or job applicants, for research or any other reason?**

☐ Yes ☐ No ☐ Not Sure

19. **Has your company conducted any of the following tests, either currently or in the past, as part of a voluntary wellness program, at the request of an employee, or for diagnosis?** *(MARK ALL THAT APPLY)*

		BIOCHEMICAL GENETIC SCREENING	CYTOGENETIC MONITORING	DIRECT-DNA SCREENING	DIRECT-DNA MONITORING
a. As part of a voluntary wellness program:	Currently	☐	☐	☐	☐
	In past 19 years	☐	☐	☐	☐
	No	☐	☐	☐	☐
	Not sure	☐	☐	☐	☐
b. At the request of the employee:	Currently	☐	☐	☐	☐
	In past 19 years	☐	☐	☐	☐
	No	☐	☐	☐	☐
	Not sure	☐	☐	☐	☐
c. For diagnosis:	Currently	☐	☐	☐	☐
	In past 19 years	☐	☐	☐	☐
	No	☐	☐	☐	☐
	Not sure	☐	☐	☐	☐

IF YOUR COMPANY HAS NEVER DONE BIOCHEMICAL GENETIC SCREENING, CYTOGENETIC MONITORING, DIRECT-DNA SCREENING, OR DIRECT-DNA MONITORING, SKIP TO QUESTION 28 ON PAGE 8

IF YOUR COMPANY HAS DONE CYTOGENETIC MONITORING, DIRECT-DNA SCREENING, OR DIRECT-DNA MONITORING OF EMPLOYEES, FOR ANY PURPOSE, BUT NOT BIOCHEMICAL GENETIC SCREENING, SKIP TO QUESTION 21 ON PAGE 7

IF YOUR COMPANY HAS EVER DONE BIOCHEMICAL GENETIC SCREENING OF ANY EMPLOYEE, FOR ANY PURPOSE, PLEASE CONTINUE WITH QUESTION 20

20. Which of the following types of biochemical screening tests are being conducted by your company of any employees or job applicants? *(MARK ALL THAT APPLY)*

FOR EACH TEST CONDUCTED, MARK WHETHER THE TESTING IS BEING DONE ON A ROUTINE BASIS FOR HEALTH SURVEILLANCE, AS PART OF A VOLUNTARY RESEARCH PROGRAM, AS PART OF FOLLOW-UP DIAGNOSIS, OR AS PART OF A VOLUNTARY WELLNESS PROGRAM, OR ONLY AT THE REQUEST OF AN EMPLOYEE

	NOT DONE	ROUTINE HEALTH SURVEILLANCE	VOLUNTARY RESEARCH PROGRAM	FOLLOW-UP DIAGNOSIS	VOLUNTARY WELLNESS PROGRAM	AT EMPLOYEE REQUEST
Sickle cell trait	☐	☐	☐	☐	☐	☐
Glucose-6-phosphate dehydrogenase deficiency (G-6-PD)	☐	☐	☐	☐	☐	☐
Methemaglobin reductase deficiency	☐	☐	☐	☐	☐	☐
Serum alpha-1-antitrypsin deficiency	☐	☐	☐	☐	☐	☐
Alpha and beta thalassemias	☐	☐	☐	☐	☐	☐
Aryl hydrocarbon hydroxylase inducibility (AHH)	☐	☐	☐	☐	☐	☐
Slow vs. fast acetylation	☐	☐	☐	☐	☐	☐
Allergic respiratory disease	☐	☐	☐	☐	☐	☐
Contact dermatitis	☐	☐	☐	☐	☐	☐
Histocompatibility markers (HLA)	☐	☐	☐	☐	☐	☐
Other immune system markers	☐	☐	☐	☐	☐	☐
Bloom syndrome	☐	☐	☐	☐	☐	☐
Fanconi syndrome	☐	☐	☐	☐	☐	☐
Ataxia-telangiectasia	☐	☐	☐	☐	☐	☐
Xeroderma pigmentosum	☐	☐	☐	☐	☐	☐
Other heterozygous chromosomal instabilities	☐	☐	☐	☐	☐	☐

21. Which of the following types of cytogenetic monitoring are being conducted by your company of any employees? *(MARK ALL THAT APPLY)*

FOR EACH TEST CONDUCTED, MARK WHETHER THE TESTING IS BEING DONE ON A ROUTINE BASIS FOR HEALTH SURVEILLANCE, AS PART OF A VOLUNTARY RESEARCH PROGRAM, AS PART OF FOLLOW-UP DIAGNOSIS, AS PART OF A VOLUNTARY WELLNESS PROGRAM, OR ONLY AT THE REQUEST OF AN EMPLOYEE

	NOT DONE	ROUTINE HEALTH SURVEILLANCE	VOLUNTARY RESEARCH PROGRAM	FOLLOW-UP DIAGNOSIS	VOLUNTARY WELLNESS PROGRAM	AT EMPLOYEE REQUEST
Chromosomal aberrations	☐	☐	☐	☐	☐	☐
Sister chromatid exchanges	☐	☐	☐	☐	☐	☐
Mutations by assaying the DNA	☐	☐	☐	☐	☐	☐
Mutations by assaying the enzyme/protein	☐	☐	☐	☐	☐	☐
HPRT mutation rate	☐	☐	☐	☐	☐	☐
DNA adduct formation	☐	☐	☐	☐	☐	☐
Other (SPECIFY)						
_____	☐	☐	☐	☐	☐	☐

22. Has genetic screening or monitoring ever been done in your company based on:

	YES	NO
Family history	☐	☐
Gender	☐	☐
Ethnic or racial background	☐	☐
Co-factors (e.g., smoking)	☐	☐
Job exposures	☐	☐

23. Are all employees routinely informed of abnormal (positive) findings, normal (negative) findings, both or neither from genetic screening and monitoring tests?

- Abnormal (positive) ☐
- Normal (negative) ☐
- Both ☐
- Neither ☐

24. Is counseling offered to all employees with abnormal (positive) genetic test results by the company or are they referred to their own physicians?

- Company counseling ☐
- Referred to own physicians ☐

25. **Does your company employ or contract with a genetic counselor?**

☐ Employ ☐ Contract with ☐ Neither

26. **Has an employee ever been referred for genetic counseling by your company's medical staff as a result of any medical or genetic testing?**

☐ Yes ☐ No

27. **As a result of a genetic screening or monitoring program has your company ever.....?**

	YES	NO
Suggested an employee seek job elsewhere.....	☐	☐
Placed an employee or transferred an employee to a different job in the company.....	☐	☐
Implemented engineering control.....	☐	☐
Recommended personal protection devices.....	☐	☐
Implemented a research program.....	☐	☐
Discontinued a product or changed materials in a product.....	☐	☐

28. **Has your company ever instituted or changed a workplace practice or exposure level due to the results of:**

	YES	NO
Genetic monitoring in your own establishment(s).....	☐	☐
Other non-genetic medical monitoring in your own establishment(s).....	☐	☐
Genetic monitoring in another company's establishments.....	☐	☐
Other non-genetic medical monitoring in another company's establishments....	☐	☐
Information published by federal agencies, including NIOSH and OSHA.....	☐	☐

29. **In the past 10 years has your company chosen not to use genetic screening or monitoring due to the results of:**

	YES	NO
Genetic monitoring in your own establishment(s).....	☐	☐
Genetic monitoring in another company's establishments.....	☐	☐
Genetic screening in your own establishment(s).....	☐	☐
Genetic screening in another company's establishments.....	☐	☐

30a. Which office determines whether or not a specific test will be conducted as part of pre-employment screening?

30b. Which office determines whether or not a specific test will be conducted as part of employee health surveillance?

	PRE-EMPLOYMENT SCREENING	EMPLOYEE HEALTH SURVEILLANCE
Corporate personnel	☐	☐
Corporate health	☐	☐
Location personnel	☐	☐
Location health	☐	☐
Other (SPECIFY) _____	☐	☐

31. Is your company currently considering conducting direct-DNA screening of employees or job applicants for any reason?

☐ Yes ☐ No ☐ Not Sure

32. Is your company currently considering conducting direct-DNA monitoring of employees or job applicants for any reason?

☐ Yes ☐ No ☐ Not Sure

33. Does your company anticipate conducting any biochemical genetic screening, for any reason, in the next five years?

☐ Yes ☐ No ☐ Not Sure

34. Does your company anticipate conducting any cytogenetic monitoring, for any reason, in the next five years?

☐ Yes ☐ No ☐ Not Sure

35. Does your company anticipate conducting any direct-DNA screening, for any reason, in the next five years?

☐ Yes ☐ No ☐ Not Sure

36. Does your company anticipate conducting any direct-DNA monitoring, for any reason, in the next five years?

☐ Yes ☐ No ☐ Not Sure

37. Which office/division within the company is/will be responsible for administering genetic tests?

_____

38. Which position/office within the company is/will be responsible for interpreting genetic test results?

_____

39. Which office in your company is responsible for employee health records?

Medical/Occupational health..... ☐
Personnel..... ☐
Other (SPECIFY)

_____

40. Does your company permit access to employee medical records -- at company discretion, with employee permission, or both, to:

	AT COMPANY DISCRETION	EMPLOYEE PERMISSION	BOTH
Personnel department.....	☐	☐	☐
Health insurance carriers.....	☐	☐	☐
Life insurance carriers.....	☐	☐	☐
Disability insurance carriers....	☐	☐	☐
Unions.....	☐	☐	☐
Other companies.....	☐	☐	☐
Employee.....	☐	☐	☐
Employee's spouse.....	☐	☐	☐
Other family.....	☐	☐	☐

GENERAL ATTITUDES

41. How do you feel about the following general statements concerning genetic screening and monitoring in the workplace? For each statement, please indicate whether you agree strongly, agree somewhat, disagree somewhat, or disagree strongly.

	AGREE STRONGLY	AGREE SOMEWHAT	DISAGREE SOMEWHAT	DISAGEE STRONGLY
It's fair for employers to use genetic screening to identify individuals whose increased risk of occupational disease poses the potential for greater costs to the employer.....	☐	☐	☐	☐
The employer should have the option of deciding how to use the information obtained through genetic screening and monitoring.....	☐	☐	☐	☐
The decision to perform genetic screening of job applicants and employees should be the employer's.....	☐	☐	☐	☐
The decision to perform genetic monitoring of employees should be the employer's.....	☐	☐	☐	☐
Government agencies should provide guidelines for genetic screening of job applicants and employees.....	☐	☐	☐	☐
Government agencies should provide guidelines for genetic monitoring of employees.....	☐	☐	☐	☐
Genetic screening in the workplace represents a potential threat to the rights of employees.....	☐	☐	☐	☐

DEMOGRAPHICS

D1. What is the major industrial classification of your company (such as chemicals, food, textiles, etc.) ?

_____

D2. Approximately how many persons are employed in the United States by your company?

☐ Less than 1,000 ☐ 1,000-4,999 ☐ 5,000-9,999 ☐ 10,000 or more

D3. What proportion of the establishments in your company have occupational health care professionals on premises?

☐ All ☐ Most ☐ Some ☐ Few ☐ None

D4. Which of the following types of health professionals are employed, either full or part time, as part of the occupational health staff of this company?

☐ Physicians (MD/DO) ☐ Physician assistants ☐ Nurse practicioners ☐ Registered nurses ☐ Industrial hygienists ☐ Other health professionals

D5. What is your job title?

_____

D6. What are your main job responsibilities?

_____

Thank you very much for your cooperation in answering our questions. We would also like to give you an opportunity to give us any other opinions, concerns or suggestions related to genetic testing in the workplace that you feel our questions did not address. These comments may be incorporated in our report to Congress. We would also appreciate your comments on any survey questions that you found confusing or difficult to answer, to help us analyze the results. Please write these comments below.

_____

_____

_____

_____

_____

_____

We have attached a peel-off identification number on the questionnaire. This is the only link between the companies who were sampled and the questionnaires returned. We would prefer that you leave the identification number on the questionnaire when you return it. Our staff will remove the label upon receipt, making the questionnaire completely anonymous. No linkage between companies and questionnaires will be retained. The label from the completed questionnaire will allow us to eliminate your company from those that we have to recontact.

However, if you feel that you cannot complete the questionnaire if there is even temporary identification, then peel off the label before returning the questionnaire. We appreciate your help and we want you to be comfortable with doing the survey.

_____

PEEL OFF LABEL WITH SAMPLE IDENTIFICATION NUMBER HERE

_____

PLEASE RETURN IN THE POSTAGE PAID RETURN ENVELOPE SENT WITH THE QUESTIONNAIRE. IF THE RETURN ENVELOPE HAS BEEN LOST, THE RETURN ADDRESS IS:

Schulman, Ronca and Bucuvalas, Inc.
444 Park Avenue South
New York, New York 10016

(212) 481-6200 Attn: Dr. Mark Schulman

Survey Instrument: Corporate Personnel Officers

SURVEY OF WORKPLACE HEALTH AND GENETIC SCREENING AND MONITORING

CORPORATE PERSONNEL OFFICER VERSION

The Congressional Office of Technology Assessment is conducting a national survey of the opinions and experiences of employers related to the use of genetic screening and monitoring in the workplace. This questionnaire has been directed to you as the person in your organization whose responsibilities include personnel issues. We need your assistance in answering, as best you can, some questions about workplace testing and employee health in your company.

For the purposes of this survey and the subsequent report, OTA has adopted the following definitions. By genetic monitoring, we mean periodically examining employees to evaluate modifications of their genetic material via tests such as cytogenetic or direct-DNA tests. By genetic screening, we mean screening job applicants or employees for certain inherited characteristics. Screening tests may be biochemical tests or direct-DNA tests. They can be used to indicate a predisposition to an occupational illness if exposed to a specific environmental agent, or they could be used to detect any inherited characteristic such as Huntington's disease. In contrast to periodic monitoring, screening tests are generally performed only one time per characteristic.

This is an important study, which has been requested by the Congress of the United States, designed to represent the opinion and experience of the employer. We need to know how employers view the technologies of genetic screening and monitoring in terms of their current and future applications to the workplace. We also want to know how these technologies are seen in the broader context of more common forms of employee health screening and monitoring in the workplace.

Your responses are very important, regardless of whether you have had any experience with genetic screening or monitoring. If your company has never explored the technology, the questionnaire will only take ten minutes. If you have some experience with the technology, it may take a little longer to complete the questionnaire. In either case, your experiences and opinions will help to inform congressional opinion about this area.

Please read each question and mark the box(es) that most nearly corresponds to your answer. After each answer continue with the next question unless there is an instruction to skip to a particular question. Please feel free to qualify your answers, if you feel it is necessary. You are free to decline to answer any questions that you consider inappropriate. The questionnaire and any identifying information will be destroyed after data entry, so that all responses will be anonymous as well as confidential. Space has been provided at the end for comments and opinions that you feel are not adequately represented by the survey questions.

We would like to begin with a few questions about your views on the appropriateness of employee testing in certain workplace situations.

1. **Do you think that it is generally appropriate or generally inappropriate for a company to require pre-employment health examinations of job applicants in workplace settings where there are no known health risks?**

   Appropriate..... ☐ Inappropriate..... ☐

2. **Do you think that it is generally appropriate or generally inappropriate for a company to require pre-employment health examinations of job applicants in workplace settings where there are known health risks?**

   Appropriate..... ☐ Inappropriate..... ☐

IF "INAPPROPRIATE" IN BOTH Q. 1 AND Q. 2, SKIP TO Q. 4.

3. **Would your company consider it acceptable or unacceptable to conduct a pre-employment health examination in order to:**

	ACCEPTABLE	UNACCEPTABLE
Identify job applicants who are physically unfit for employment	☐	☐
Identify job applicants who are emotionally or psychologically unstable	☐	☐
Identify job applicants who are currently using drugs	☐	☐
Identify job applicants who are at increased risk to workplace hazards	☐	☐
Identify job applicants with genetic susceptibility to workplace exposures	☐	☐
Identify job applicants who represent high insurance risks	☐	☐

4. **Do you think that it is generally appropriate or generally inappropriate for a company to require periodic medical testing of employees in workplace settings where there are no known health risks?**

Appropriate..... ☐ Inappropriate..... ☐

5. **Do you think that it is generally appropriate or generally inappropriate for a company to require periodic medical testing of employees in workplace settings where there are known health risks?**

Appropriate..... ☐ Inappropriate..... ☐

IF "INAPPROPRIATE" IN BOTH Q. 4 AND Q. 5, SKIP TO Q. 7.

6. **Do you think that it is generally cost-effective or not cost-effective for a company to conduct periodic medical testing of employees for:**

	COST EFFECTIVE	NOT COST EFFECTIVE
High blood pressure	☐	☐
Respiratory function	☐	☐
Malignancies	☐	☐
Hearing function	☐	☐
Vision	☐	☐
Chromosomal abnormalities	☐	☐
Drug abuse	☐	☐

7. **Do you think it is currently cost-effective or not cost-effective for a company like yours to:**

	COST EFFECTIVE	NOT COST EFFECTIVE	NOT SURE
Conduct biochemical genetic tests as part of pre-employment screening	☐	☐	☐
Conduct direct-DNA tests as part of pre-employment screening	☐	☐	☐
Conduct genetic monitoring of all workers exposed to workplace hazards	☐	☐	☐
Conduct genetic screening of workers to detect genetic susceptibilities to workplace hazards	☐	☐	☐

8. Would your company consider the use of genetic tests for employees or job applicants generally acceptable or generally unacceptable to:

	ACCEPTABLE	UNACCEPTABLE
Make a clinical diagnosis of a sick employee	☐	☐
Establish links between genetic pre disposition and workplace hazards	☐	☐
Inform employees of their increased susceptibility to workplace hazards	☐	☐
Exclude employees with increased susceptibility from risk situations	☐	☐
Monitor chromosomal changes associated with workplace exposures	☐	☐
Establish evidence of pre-employment health status for liability purposes	☐	☐

9. If an employer becomes aware that an employee has a genetic susceptibility to serious illness if he or she is exposed to substances in the workplace, do you think the employer should exclude that employee from those jobs for which he/she is at increased risk, or do you think the employer should allow the employee to take those jobs, if he/she waives corporate liability?

Should be excluded..... ☐ Allowed to take..... ☐

10. As part of your pre-employment hiring practices, do you currently require each of the following as a condition of employment for all applicants, only applicants for certain plants or job classifications, only applicants with certain medical conditions or histories, or for no applicants?

	ALL	PLANTS/ JOBS	CONDITIONS/ HISTORIES	NONE
Routine physical examination	☐	☐	☐	☐
Biochemical genetic screening tests	☐	☐	☐	☐
Cytogenetic monitoring tests	☐	☐	☐	☐
Other medical criteria, e.g., lower back X-ray, allergy testing	☐	☐	☐	☐
Personality/psychological testing	☐	☐	☐	☐
Drug testing	☐	☐	☐	☐

IF "NONE" TO ALL IN Q.10, SKIP TO Q.12

11. Is it company policy to inform applicants of positive test results?

Yes..... ☐ No..... ☐

11a. Is it company policy to refer applicants to appropriate health care providers if positive test results are obtained?

Yes..... ☐ No..... ☐

12a. Does your company have a policy concerning hiring....

FOR EACH "YES" IN Q. 12a

12b. Generally speaking, would you say it is against company policy to hire....

	Q.12a HAVE POLICY NO	Q.12a HAVE POLICY YES	Q.12b AGAINST POLICY YES	Q.12b TO HIRE NO	Q.12b TO HIRE DEPENDS
Cigarette smokers	☐	☐	☐	☐	☐
Persons with criminal records	☐	☐	☐	☐	☐
Persons with pre-existing medical conditions	☐	☐	☐	☐	☐
Persons with increased genetic susceptibility to substances or conditions in the workplace	☐	☐	☐	☐	☐

IF YOUR COMPANY HAS NEVER DONE ANY BIOCHEMICAL GENETIC SCREENING, CYTOGENETIC MONITORING, DIRECT-DNA SCREENING, OR DIRECT-DNA MONITORING, SKIP TO QUESTION 19.

13. To the best of your knowledge, which of the following were important factors in the decision to conduct genetic screening or monitoring of employees in your company?

	IMPORTANT	NOT IMPORTANT
Cost benefit analysis	☐	☐
Evidence of a possible association between chemical exposure and illness in animal studies	☐	☐
Evidence of a possible association between chemical exposure and illness in epidemiological studies	☐	☐
Legal consequence of failure to test	☐	☐
Union/employee initiative	☐	☐
Something else (Please Specify) _____	☐	☐

14. To the best of your knowledge, has your company ever rejected a job applicant, primarily or partly, based on the results of genetic screening tests?

Yes..... ☐ No..... ☐ → *SKIP TO Q. 15*

14a. When was the most recent time that occurred?

Within past month..... ☐
Within past year..... ☐
1-2 years ago..... ☐
3 or more years ago..... ☐

14b. What was the condition(s)?

_____

14c. Was the applicant informed of the reason for the rejection?

Yes..... ☐ No..... ☐

14d. Was alternative employment within your company offered?

Yes..... ☐ No..... ☐

15. Have any medical or physical criteria been specified that would disqualify individuals from:

	YES	NO
Work in the company.....	☐	☐
Work in specified plants or locations.....	☐	☐
Work in specified jobs.....	☐	☐

16. Does your company maintain statistical data on job applications, outcomes, and reasons for rejection?

Yes..... ☐ No..... ☐ → *SKIP TO Q. 18*

17. Are biochemical or cytogenetic tests used as rejection categories in these data?

Yes..... ☐ No..... ☐

18. Has your company ever transferred or terminated an employee, primarily or partly, based on the results of genetic screening or monitoring?

Yes..... ☐ No..... ☐ → *SKIP TO Q. 19*

18a. When was the most recent time that occurred?

Within past month..... ☐
Within past year..... ☐
1-2 years ago..... ☐
3 or more years ago..... ☐

18b. What was the condition?

_____

18c. Was the employee informed of the reason for the action?

Yes..... ☐ No..... ☐

19. Is it your company's policy to conduct periodic medical testing of persons in any risk categories?

Yes..... ☐ No..... ☐ → *SKIP TO Q. 20*

19a. Is it company policy to inform employees of positive test results?

Yes..... ☐ No..... ☐

19b. Is it company policy to refer employees to appropriate health care providers if positive test results are obtained?

Yes..... ☐ No..... ☐

19c. Is it company policy to release positive test results to anyone outside of the company, other than the employee?

Yes..... ☐ No..... ☐ → *SKIP TO Q. 20*

19d. Under what circumstances?

_____

19e. Was alternative employment within your company offered?

Yes..... ☐ No..... ☐

19f. Does your company have a set of guidelines for this type of situation or is it left to the discretion of the particular establishment?

Yes..... ☐ No..... ☐

20. Does your company maintain statistical data on the reasons for job terminations?

Yes..... ☐ No..... ☐ → *SKIP TO Q. 21*

20a. Are biochemical or cytogenetic tests used as rejection categories in these data?

Yes..... ☐ No..... ☐

20b. Are other medical criteria used as rejection categories in these data?

Yes..... ☐ No..... ☐

21. Within the next five years, do you anticipate that your company will conduct:

	YES	NO
Mandatory biochemical genetic screening.....	☐	☐
Voluntary biochemical genetic screening.....	☐	☐
Mandatory cytogenetic monitoring.....	☐	☐
Voluntary cytogenetic monitoring.....	☐	☐
Mandatory DNA-based genetic screening.....	☐	☐
Voluntary DNA-based genetic screening.....	☐	☐
Mandatory DNA-based genetic monitoring.....	☐	☐
Voluntary DNA-based genetic monitoring.....	☐	☐

22. If you were asked, would you recommend to your company that genetic screening be done as part of pre-employment screening?

Yes..... ☐ → Based on what criteria? _____

_____

No..... ☐

23. If you were asked, would you recommend to your company that periodic genetic monitoring of employees be done?

Yes..... ☐ → Based on what criteria? _____

_____

No..... ☐

24. Approximately what proportion of your employees are covered by collective bargaining agreements?

Less than 10%..... ☐

10% to 49%..... ☐

50% to 75%..... ☐

More than 75%..... ☐

25. Have union contract negotiations ever covered the topic of genetic screening and/or genetic monitoring?

Yes..... ☐ No..... ☐

26. What proportion of your company's employees are covered by health insurance offered by the company?

All.....☐ Most.....☐ Some.....☐ Few.....☐ None.....☐ → *SKIP TO Q. 27*

26a. Is the company's current health insurance plan(s) purchased from a private carrier, self-insured or both?

Private carrier.....☐ Self-insured.....☐ Both.....☐

27. If a job applicant is currently healthy and able to perform the job, but is considered to be a health insurance risk, would that consideration reduce the likelihood of his/her being hired by your company -- a lot, some or not at all?

A lot.....☐ Some.....☐ Not at all...☐

28. Does your company assess the health insurance risk of job applicants on a routine basis, sometimes or never?

Routine.....☐ Sometimes....☐ Never.....☐ → *SKIP TO Q. D1*

28a. Does the health insurance assessment of job applicants also consider the health of dependents?

Yes.....☐ No.....☐

DEMOGRAPHIC CHARACTERISTICS

D1. What is the major industrial classification of your company (such as chemicals, food, textiles, etc.) ?

_____

D2. Approximately how many persons are employed in the United States by your company?

Less than 1,000.....☐
1,000 - 4,999.....☐
5,000 - 9,999.....☐
10,000 or more.....☐

D3. What is your job title?

_____

D4. What are your main job responsibilities?

_____

Thank you very much for your cooperation in answering our questions. We would also like to give you an opportunity to give us any other opinions, concerns or suggestions related to genetic testing in the workplace that you feel our questions did not address. These comments may be incorporated in our report to Congress. We would also appreciate your comments on any survey questions that you found confusing or difficult to answer, to help us analyze the results. Please write these comments below.

_____

_____

_____

_____

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_____

We have attached a peel-off identification number on the questionnaire. This is the only link between the companies who were sampled and the questionnaires returned. We would prefer that you leave the identification number on the questionnaire when you return it. Our staff will remove the label upon receipt, making the questionnaire completely anonymous. No linkage between companies and questionnaires will be retained. The label from the completed questionnaire will allow us to eliminate your company from those that we have to recontact.

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